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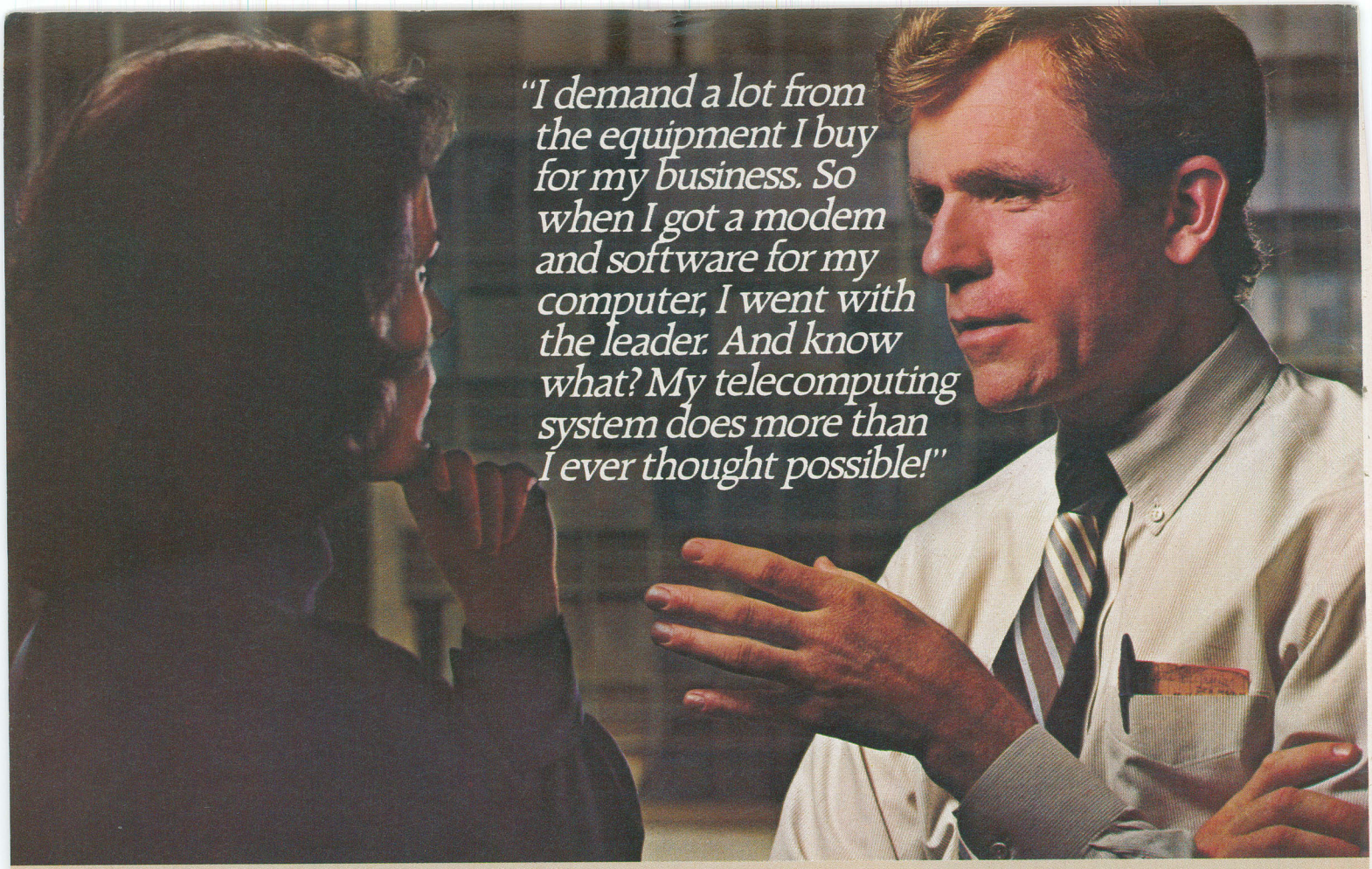

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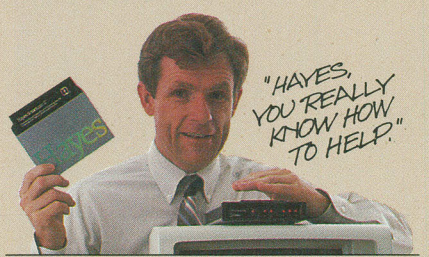

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Inside MIDI

The MIDI interface, and the ensuing hardware which followed it, has changed the face of electronic based music every bit as much as Moog and his truckload of patch cords. Here's a look at the state of the art of computer music.

by Gregory Stephen

[The author is Remenyi House of Music's illuminatii on computer based music and a member of the New Digital Orchestra, mentioned elsewhere in this issue]

Programming is an old friend of analog synthesis. Over the years vastly different skills have been required of musicians, according to the concept inherent in various pieces of hardware they were playing at the time. Playing a traditional instrument, such as a flute or a guitar, can be thought of as running a program one keeps in one's head.

The wildly patched keyboardist strangling in a maze of wires is, in fact, an image from the period when analog synthesizers had reached their zenith. Voltage controlled instruments, usually implementing some modular concept, required the user to perform a sort of programming in hardware where specific units were patched together. Visually this bore a striking resemblance to Lily Tomlin's telephone switchboard.

A new period of music began with electronic sound, and, as is true for many other disciplines, much of the credit is due to early pioneers, like Edison, who helped develop an electrical analog for acoustic sound. The moment vibrations were controlled in hardware, an instrument for music was born.

All this has come quite a long way... perhaps rather further than you may have thought. If you aren't quite sure what this article is all about... if MIDI is still a style of skirt for you... you may be startled to learn of the virtuosity the once bizarre field of computer based electronic sound has attained.

Moving Waves

Concurrent with advancements within the science of acoustics came an awareness on the part of musicians that progress for electronic music pointed directly to waveform theory. Primarily in the interests of acoustic realism, it was determined that finite waveform resolution was required if an electronically generated sound was to duplicate its acoustic counterpart.

The dilemma became quite complex in the sense that, to achieve true accuracy, the time domain had to be taken into consideration in order to determine how a wave's form changed over time. In the case of digital technology, one solution was to quantize, or sample, a sound's energy at regular intervals and store the resulting values in a computer's memory... essentially analog to digital conversion. The sound could then be recreated by calling up the same values from memory and processing the data through a digital to analog convertor.

This method yielded excellent results. In fact, several musical instruments were little more than extensive RAM memory, a microphone and a music keyboard. With the recent entry of digital FM synthesis, under the direction of an Apple, the concept is almost complete in terms of implementing waveform theory to the point where any conceivable sound might easily be synthesized.

The Musical Instrument Digital Interface, or MIDI, is a specification for a protocol of communication between diverse music hardware. As with the evolution of waveform hardware, the pursuit of a specialized solution inevitably produces a piece of dedicated hardware. In the modern recording studio, it is not unusual to see a dozen independent music systems, many operating under custom LSI processors, such as as rhythm units, sequencers, digital delays, equalizers and rack oscillators.

The MIDI concept allows hardware to come on line together in a common conference call format. In order to acquire a balanced understanding of the full significance of MIDI, we should examine it from a dual viewpoint, first in terms of the technical programming aspect and finally as implemented in a practical way by musicians themselves.

The Musical Instrument Digital Interface, or MIDI, is a specification for a protocol of communication between diverse music hardware.

The Mind of MIDI

MIDI is, to begin with, a *serial bus* with an associated physical arrangement, a five pin DIN plug, and a communications protocol. The MIDI standard specifies communication at 31.25 kilobaud. The communications rate is fast enough to appear instantaneous in real time, and the cables are so common that every Radio Shack store has pots of them without even knowing it.

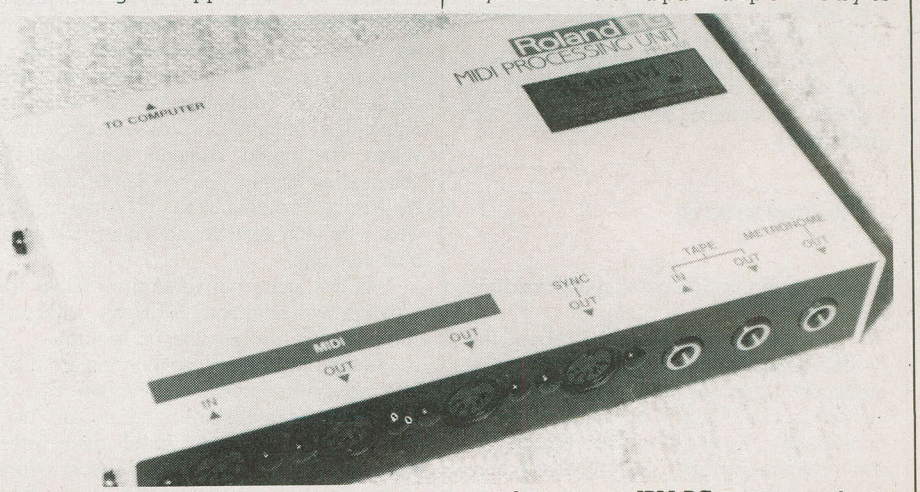
If we examine a piece of MIDI hardware... a music synthesizer for example... we will see, on its back panel, several MIDI ports. These are usually labeled MIDI IN and MIDI OUT... There may be a third connection, MIDI THRU, which provides a duplicate copy of the data arriving at the input, allowing several MIDI devices to be daisy chained together.

Although much of the current excitement in music centers around computer based MIDI software, it is possible to simply connect two or more MIDI units together through a five pin DIN cable. Take for example, the case of two MIDI music keyboard synthesizers. Once connected through MIDI cables the units would sound in tandem. If we played notes on the first keyboard, the same notes would simultaneously sound on the second. This factor alone can enable a single keyboard performer to play several instruments simultaneously.

The phantom of the opera would have been pleased.

If we decipher the data flowing through a MIDI cable between two keyboards, we would know the code that tells a keyboard to start playing. The most basic convention within a MIDI system is the recognition of a common pitch or frequency. To implement this, all the notes we might find on a regular piano have been assigned unique numbers. MIDI recognizes middle C, a frequency of two hundred and fifty-six hertz, as being a byte value of 3CH, or sixty decimal.

For each increment in this sequence MIDI recognizes a change of one semi-tone on the music keyboard. A polyphonic keyboard would output multiple note bytes



The Roland MPU401 allows a microcomputer... in this case an IBM PC, to communicate with a MIDI keyboard. The four DIN connectors are the standard MIDI interface.

Inside MIDI

if a chord were struck.

Mixed in with the stream of data bytes are status bytes. These values advise MIDI equipment about the meaning of the data bytes which follow. In our example of playing middle C, 3CH, MIDI would generate, in advance, a status byte, 90H, telling another MIDI device that the approaching byte, 3CH, is to be interpreted as pitch.

Fortissimo... Hardware

There are several other music keyboard states that MIDI may monitor. If we press the keys of a piano down slowly, we would notice that the sound is quite soft compared to the volume when the keys are struck with force. This means the keyboard is *velocity sensitive*... this information may also be encoded by MIDI.

Some keyboards are also pressure sensitive. Once a note is played and held down, the keyboard reacts if there is a change in the key pressure. This is similar to pressing a button to ring a bell. If the button were pressure sensitive, as we held and pressed the button harder, it might increase in volume or alter the quality of the bell's tone. Pressure data is recognized by MIDI on a one hundred and twenty-eight level digital scale.

We now have three consecutive pieces of information coded as bytes. A byte of 90H is the status. It indicates that the next byte will be pitch. The next byte, 3CH, indicates that the middle C key has been struck. The next byte, say 40H, is the velocity data. It specifies how hard the key has been struck.

If these values were sent to a MIDI synthesizer, it would sound the note middle C with no one touching the keyboard. In fact, it would continue to sound that same note forever. The synthesizer thought someone had pressed a key... it must also be convinced that the key has been released.

One way to accomplish this would be to send the same information but with the velocity, or volume, set to zero. The code might read

90 3C 40 90 3C 00

which would turn the note on and then turn it off again.

Considering this travels at about thirty-one kilobaud, the note would almost immediately turn itself off as soon as it was turned on. MIDI software therefore incorporates data representing the period between real time events, such as a key going down and then up.

The Yamaha DX-7 is a powerful MIDI keyboard. While playable as a keyboard, it can be entirely controlled by a computer. It gives a micro access to better sound synthesis facilities than are found in most synthesizers.

The complete MIDI specification lists many other parameters. In addition, the serial interface provides for a flow of up to sixteen separate data channels. Different MIDI instruments on line may be assigned specific channel numbers... code which is not prefaced by that particular instrument's channel number is ignored. This permits true orchestral composition, by providing for discrete channels, or instruments.

Pop Music

In June of 1981 at the National Association of Music Merchants trade show in Chicago, there were hundreds of musical instruments on display. In one small hidden corner of the giant convention center there was a simple keyboard connected directly to a lone Apple II+ computer. Curious competitors within the music business were quietly visiting this display, like spectators at an early Wright Brothers flight. The equipment was a version one Soundchaser computer music system.

At this same convention in 1984, the situation was reversed. A display without a computer was rather difficult to find.

Contemporary music journals are filled with advertisements for computer related hardware. Manufacturers, in a leap frog fashion, are quick to extol their latest alliance with the computer. Almost every serious keyboard is now MIDI compatible, and increasingly better software appears regularly.

Computerists who may not be proficient on a music keyboard might be interested in the addition of MIDI sound modules to their systems. These modules contain the keyboard's sound circuitry without the keyboard... something rather better than a square wave synthesizer designed in Taiwan. Special programs, even pre-recorded songs on disk, might then be performed at home, with all the immediacy of a concert performance.

Admittedly, adding a MIDI system to your computer may not be an inexpensive venture. Even a modest setup could easily equal the cost of the computer itself, and it is not uncommon to find musicians bypassing micros altogether, working with dedicated and expensive miniprocessors.

The power of MIDI, however, is vast. It's probably fair to say that even the system's designers cannot speak to the potential of it. MIDI blows away limitations which have been before musicians for twenty centuries.

Unfortunately, paper is a poor medium for describing sound. The only way to truly experience MIDI is to work with it. However, be warned, it's a mesmerizing experience... you'll never be impressed with a nine voice music card... or, perhaps, with a ninety piece orchestra... again.

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COMPUTER PRESS

Pirate Protection

LONDON, ONTARIO — A controlled access device for computers that protects a data base from unauthorized entry but allows immediate dial-up access for legitimate remote terminal users is available from *3M Canada Inc.*, Integrated Office Systems.

The **SYKEY** dial-up access control device screens calls from all remote locations, blocking the ring to prevent the modem from answering and making a connection only when a valid code is entered. The unit operates in conjunction with either touch tone or pulse from any location, and does not require a dedicated terminal. Authorized users may enter codes by touch tone or by voice and may access information immediately without waiting for a call back.

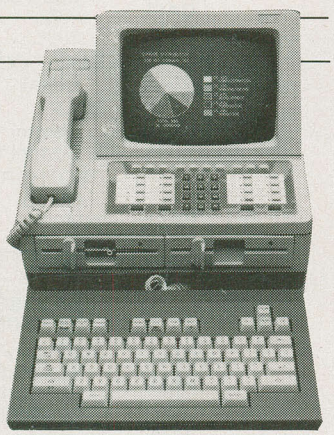
The controlled access device initially answers by voice, eliminating the modem tone that allows a "hacker" 's computer to recognize a data line during a random dialling sequence. A standard busy signal is given if the protected modem happens to be in operation.

Should unauthorized contact be made, the security device can be set to accept from one to nine in valid attempts before an alarm is activated. On an even nine attempts, the laws of chance make it virtually impossible for data thieves to discover the correct code by running an algorithm.

Full dial-out capability is provided, allowing outbound modem operation whenever the telephone line is not in use.

For further information, contact 3M Canada Inc., Integrated Office Systems, P.O. Box 5757, London, Ontario N6A 4T1.

A PC Forest



TORONTO, ONTARIO — **Cedar** and **Juniper** are two innovative products recently announced by *ROLM Canada Incorporated* that incorporate the power of the IBM PC with telecommunications.

Cedar is a compact unit containing a multi-line digital telephone with two-way speakerphone, advanced voice and data communications capabilities, a personal computer and personal productivity services.

The IBM PC-compatible Cedar runs IBM PC business application software. High-speed communications hardware and software are built in so that Cedar users can easily use presorted terminal profiles with auto-dial and auto-log capabilities to gain access to minicomputers, mainframes and public data bases. Files can be transferred to and from other Cedars, Junipers or PCs that use IBM's Asynchronous Communications package. Data communications and file transfer can be done at the same time as a voice call, without requiring two telephone lines.

Juniper, available to users of existing IBM PCs, consists of an adapter board, special communications and personal-productivity software and a multi-line digital telephone with a two-way speakerphone.

Juniper runs on an IBM PC or XT with at least 256K of RAM and PC-DOS 2.0 or 2.1.

For more information about the products, write *ROLM Canada Incorporated* at 4 Lansing Square, Willowdale, Ontario M2J 1T1, or call (416) 498-7656.

Geneva Talks

WILLOWDALE, ONTARIO — *Epson Canada* has expanded its microcomputer line with a notebook-size portable featuring a Z-80 processor with 64K RAM. Optional peripherals include a powerful 3 1/2" battery-operated floppy disk drive, a direct connect modem, RAM expansion up to 184K and a thermal printer.

Selling at a base price of only $1499, the Epson **Geneva/PX-8** has a standard CP/M 2.2 operating system and comes with three ROM-based MicroPro software packages — including Portable WordStar — covering the more popular applications: word processing, spreadsheet and scheduler.

Epson's portable weighs about four pounds and is easily encased within a briefcase. Measuring roughly the size of a magazine, the PX-8 features an 8-line-by-80-character adjustable high resolution LCD display screen, a full-sized ASCII keyboard with numeric keypad functions and a built-in microcassette drive for data storage.

The Geneva also provides password protection, which can be individually tailored, ensuring data security.

Epson Canada is at 285 Yorkland Boulevard, Willowdale, Ontario M2J 1S5 and can be reached at (416) 495-9955.

Correction

COMPUTING NOW! — In the Directory section of our October 1984 issue, we listed the address for **Toronto Software World** incorrectly. The correct mailing address is P.O. Box 84, Agincourt, Ontario MlS 3B4. We apologize for any inconvenience this may have caused.

Next Month In Computing! Now!

Telecommunications

Connecting a modem to your computer avails it of a whole new world of activities. You can access on line data bases, call bulletin boards, exchange software . . . your phone will never know what's happening to it. In the next issue of Computing Now! we'll be featuring a look at the law as it is evolving for telecommunications, several sophisticated terminal programs and instructions for making all those wires, connectors, bits and bauds work for you . . . as opposed to crawling in through your ears and playing mumbly peg with your brain, as they probably presently do.

LIST! Special

Small furry routines that curl up around your toes and keep 'em warm in the cruel winter frost are so nice to have around the cave. In the next issue of CN! we'll be presenting quite a variety of short programs to meddle with. Submitted by our readers, LIST! offers some of the most innovative ideas for programmers of all levels.

HP Portable Review

Unlike the Bondwell 14, the Hewlett Packard portable computer doesn't talk. However, it is a lot easier to carry, being about the size of a moderately literate dictionary, and is so slick as to make it hazardous to drive on. As luck would have it, no one has actually expressed any interest in driving on it just yet, although the possibilities for doing things like mobile word processing, data entry and telecommunications on the system damage the mind with their scope. We'll be peeling back the shrink wrap next month.

Continued on p 78

GUESS WHAT'S NEW IN CANADA?!!

Flexidraw

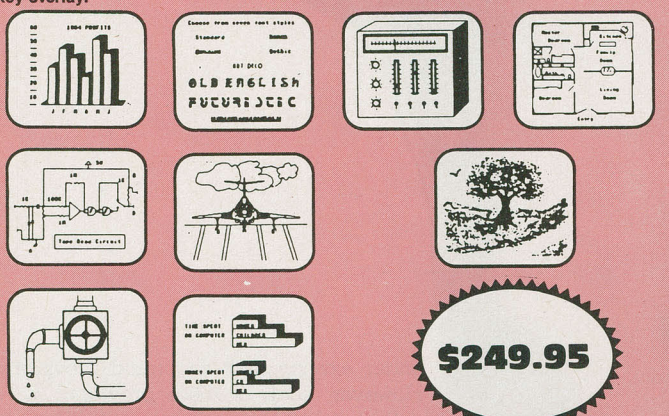
A modern alternative to Pencil and Paper

FLEXIDRAW is a versatile graphics software program coupled with a high performance light pen for the Commodore 64 Computer. The Flexidraw package enables 64 users to perform pencil and paper routines utilizing the speed and full graphic capabilities of their computer. As a result, the C-64 user can produce from simple free-hand sketches to complex CAD-type drawings.

Features:

• Light pen driven, on-screen menu with full audio/ video feedback includes these features: Line . . . Box . . . Circle . . . Arc . . . Ellipse . . . Sketch . . . Air brush . . . Zoom . . . Rubberband . . . Cross hair . . . Grid • Pattern fills and shading with 512 pattern choices • Oops feature for "fill spill" • Two separate work screens • Split screen function • Flip or rotate images • Eight font styles in standard or expanded size • Three line widths • Images easily manipulated using GET/PUT comands • A library of symbols to aid in producing electronic schematics . . . architectural floor plans . . . math and scientific equations • Full disk access from program • Print drawings in two sizes or link them side by side • Print in black and white or color • Compatible with Micron Technology's Micron Eye digitizing camera

This FLEXDRAW™ package includes: Light pen, User's manual, 5-1/4" Floppy disk, Key overlay.



The applications of the Flexidraw are limited only to the user's imagination.

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The SLR is available for Commodore 64. Your SLR includes 6 action-packed disk games with full sound effects. . .
For games that require agility and fast reaction, the SLR can break down to a pistol.

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Software Piracy and the Law

Since the dawn of real time... about five years ago... the law has all but supported software piracy. Things are changing, though.

[The author is a business lawyer specializing in computers and the law, with the Toronto law firm of Seon, Gutstadt and Associates.]

By David Latner

The criminal concepts of theft and fraud have evolved over centuries. The rise of the information society and widespread computerization has created new types of valuable property and new methods of stealing such property. Until very recently, attempts to prosecute computer related crime revealed various weaknesses in the law.

The basic computer crime issues are the unauthorized acquisition or destruction of hardware, software, or computerized information, and unauthorized use of computer services. Existing laws adequately protect against hardware related crimes. Software and data related crimes have caused problems.

This article concentrates on software piracy.

All Rise

The criminal code was drawn up and has evolved through a pre-computer age case law interpretation. Unauthorized acquisition of software would usually be dealt with under existing theft and fraud provisions. However, each of these provisions have definitional weaknesses making it difficult to protect a software owner's rights.

It is difficult to stuff the new technological realities and relationships into the old pigeon hole definitions.
More definition of terms like "property" or "anything" to encompass information. Therefore it has been questionable whether mere unauthorized taking of information constituted theft.

Judges are aware that in the real world, confidential information or marketable programs, even without copyright, would be regarded as valuable property. They know that disinterested observers would consider that a theft and monetary loss has beenincurred if a program or information is wrongfully copied. They do not necessarily feel the offenders should go unpunished.

However, a strong legal tradition exists that only conduct clearly designated as criminal should be criminally punished. Therefore, in cases of doubt the law is interpreted narrowly in favour of defendants. There is a judicial consensus that if an act is to be deemed criminal, parliament must specifically do so, not unelected judges.

Fortunately for piracy victims... soft-

ware developers, publishers, retailers, users and everyone who benefits from a vibrant, creative, risk taking software industry... recent criminal cases and legislative amendments herald relief and a more practical approach to information age reality.

Snatch and Grab

The Criminal Code states that if there is deprivation of "anything", there is theft. Cases generally hold that "anything" refers to "property". Most hold that the mere taking of information is not theft of "property". In the Queen versus Stewart, a Canadian court recently held, for the first time, that confidential information at least, is property.

In Stewart, a union sought to organize certain hotel workers. Personnel records were required. The union indirectly offered to pay a hotel employee to copy such records. Stewart, who approached the employee, was charged with counselling to commit fraud and theft. The trial judge acquitted him. He found that even confidential information was not property in the eyes of the law.

On appeal, Stewart was convicted. One judge dissented, following traditional reasoning. Two favoured conviction. One held that not all information was property, but that the definition was broad enough to cover confidential information "gathered through the expenditure of time, effort and money by a commercial enterprise for the purpose of its business." As far as deprivation was concerned, he noted that the information, once copied, would lose its confidentiality, the very element which brought the information within the definition of property.

If copying would deprive the owner of confidentiality, then that was sufficient deprivation. This overturned the narrower, semantic approach which held that mere copying did not deprive the owner of anything because the paper or data copied still remained intact in the owner's possession.

The second convicting judge agreed completely, adding that if reasonable security is exercised over certain information, it is logical to assume it is considered confidential. Furthermore, he noted that the personnel lists were copyrightable material.

Copyright is a property interest. As such the owner was entitled to protection under the copyright act. Copyright gives the owner the exclusive right to copy originals and to take civil action to prevent others from doing so. Importantly, copyright does not depend on confidentiality, but does yield a protectable property interest.

Fraud

"Every one who, by deceit, falsehood or other fraudulent means ... defrauds any person of any property, money or valuable security ...", is guilty of fraud. The rule seems clear cut, but has been interpreted narrowly, until recently in the Queen versus Kirkwood case.

Kirkwood owned a company operating three stores retailing videotape cassettes. He knowingly sold counterfeit tapes and was aware that this practice deprived the copyright owners of distribution rights and income. Kirkwood was charged with fraud.

The trial judge followed precedents stating that the law required a relationship between the accused and the victim, whereby the former used deceit or falsehood to defraud and deprive the latter. Since the accused and the victim had no relationship whatsoever, no "con" being aimed against the film studio that owned the reproduction rights, the court held that no fraud occurred. Despite the obvious pirating, that is, by the use of a video recorder, and unfairness, the trial judge felt compelled to acquit Kirkwood.

On appeal, Kirkwood was convicted. The appellate court agreed that no relationship existed between the pirate and the victim film studio, but held such relationship irrelevant on the facts.

Looking at the statute, the court distilled dishonest conduct and deprivation suffered by the victim as the two essential elements of fraud. The dishonesty was clear, and piracy was proven.

Deprivation in this case was proven by showing that the retailing of pirate products reduced the market for, and revenues from, sales of legitimate copies. No directly deceitful relationship need exist if the accused defrauded by other fraudulent means, such as illicit pirating for profit.

Software Piracy

It will be apparent by now that all this *does* have a bearing on microcomputers. Legal decisions are based on precidents rather than blinding insights. As such, software piracy laws are being derived from the analogous situations.

Stewart and Kirkwood dealt with confidential lists and copyrighted videos. However, their fact situations are sufficiently similar to software piracy situations that their reasoning should be adopted in such cases. By analogy with Stewart, unauthorized copying of confidential data base information, a favourite pastime of hackers, or of confidential source or object code, a common element when employees leave for the competition, or in industrial espionage, could constitute theft.

If confidential information is generally protectable property, confidential data bases and programs should be protected as they are subsets of that category.

Similarly, as was implied in Stewart and stated in Kirkwood, criminal law protection may exist even for non–confidential information in which copyright subsists. Copyright subsists, to a greater or lesser degree in most software. Again, if anti–fraud laws can be used to crack down on pirates of copyrighted films, they should be usable against pirates of copyrighted software.

These recent cases illustrate how long standing criminal law can be used against piracy. The key has been a judicial willingness to take a more practical and realistic approach toward interpreting and applying the law to new technology and relationships.

Statutory Changes

Uncertainty as to judicial trends and the piecemeal nature of case law developments has pushed the government to create specific legislation against computer crime. Two potentially important amendments exist. One broadens the definition of mischief to cover destruction, alteration, or interference with the lawful use of information.

The second amendment, more closely related to piracy, creates a combined theft and fraud section for computer crime.

The amendments implicitly recognize that information has a value which should be protected by the criminal law. They do not use the word "property" so semantic defenses on that issue will be avoided. Conviction results in up to ten years' imprisonment.

Piracy is not explicitly covered. "Persons who fraudulently or without colour of right intercept any function of a computer system are guilty of an offence... ." The word "intercept" includes "to listen to, record or acquire a communication or acquire the substance or meaning thereof."

The new section deals with information. The "intercept" definition with communications. Computer industry circles hope the judiciary will follow the Kirkwood and Stewart trends and interpret the new sections broadly, to implement the law and help defeat piracy, rather than narrowly, to defeat the legislation's remedial goal.

Piracy and the Civil Law

Upon misappropriation of company owned software by an employee, the company...

Software Piracy and the Law

the employer... could sue for breach of trust or breach of a trade secret agreement, if such connection exists. Hence most software development corporations and many organizations that buy or create custom software should require all relevant staff to sign confidentiality and non-competition agreements.

If an employee pirates software and sells it to the competition, the former employer can sue for breach of contract. However, most software is pre-packaged and licensed rather than sold, the software developer saying, among other things, "you will not copy". While this may bind the actual acquiror, it will not readily or practically bind the acquiror's employees, friends or relatives. Thus contract law alone is insufficient.

In such situations claims of copyright infringement may be effective tools to combat piracy. Copyright is one species of proprietary right, granting monopoly rights. While it subsists... for approximately fifty years at present... only the owner of copyright can reproduce a copyrighted work, or permit someone else to do so. Copyright applies to all original literary, dramatic, musical and artistic works. In light of judicial interpretation, software seems to fit under the "literary" works heading, if at all.

The copyright act, like the criminal code, long pre-dates the computer age. The general purpose of the Act, to prevent unfair, unauthorized exploitation of a person's intellectual property, should as readily applied to software as to other creative works. However, the pre-computer age definitions do not specifically cover the issue.

Pirates often use similar semantic tactics to those used to avoid criminal sanctions. If they can prove copyright does not govern the copied material they cannot be guilty of copyright infringement. One may wonder to what extent software is covered.

The term "literary work" will readily cover instruction manuals and similar documentation. Most significant software relies on documentation. Therefore, pirated software without a manual is like a flashlight without a bulb. Old cases also suggest that printed codes and compilations may be considered literary works.

Most recently, in IBM versus Spirales, IBM sought an injunction to prevent Spirales importing and selling, before trial, clones of the IBM PC. The clones contained a copy of a program included in the PC's ROM.

The court reviewed the law of various countries on whether copyright could exist in computer programs, and held that copyright does exist in computer software in Canada, both as source and object code, on disks or in ROM. Only at trial would the issue of whether the copyright had actually been infringed upon in the particular case be answered. However, since there was much evidence that there was direct copying, the injunction was granted. The last semantic refuge of pirates seems to have been breached.

Legal Evolution

Much time passes before judges and parliament adapt legal definitions and relief to cover new realities. The process continues. The judiciary and legislature will gradually extend or rewrite the law to permit copyright and criminal law to fulfill its underlying role. If the courts do not do so, legislators will... and vice versa.

The copyright act, like the criminal code, long pre-dates the computer age.

Software development is too large and too important an industry to let pirates destroy. The federal government has moved on criminal law and is already considering revision of the copyright act to meet the challenges of the information age.

Under existing and evolving law, people who pirate or sell pirated products are at risk. The lucrative stakes and the increasing scope of the civil and criminal law heightens the chances pirates will at the very least be confronted by the law... and very likely prosecuted by it. If the plaintiff cannot otherwise obtain evidence, a court order is obtainable permitting entrance into a pirate's or distributor's premises to seize offending documentation and storage media.

Apart from the disruption that such a seizure and the inevitable injunction would cause to a business, other sanctions exist. These include fines, damages for breach of contract, legal fees... your own and the other side's if you lose... imprisonment and social ignominy.

While no one expects IBM, Microsoft or the police to raid the fourteen year old hacker down the block, anyone pirating on a commercial scale can expect some pressure. This is true even if it is a small venture. In one case the police hit someone selling pirate programs at a Calgary flea market.

Software industry circles are talking about going beyond retailers to hit corporations, schools and government departments where it is common that one or two copies of a popular business or educational program will be acquired legitimately and then recopied for the professional and private use of the staff. Lotus has taken this step successfully, and others are expected to follow. Similarly, user groups can expect to be hit. Of course, not everyone will be taken to prison.

In some cases, the contractual clause in the license that is rarely read will be relied upon. In other cases copyright infringement will be pressed. Only in severe cases will criminal law be used. The aim is deterrence. If you are a pirate, beware.

Repell All Boarders

There are beginning to be lines of recourse for the software developer who thinks that his software is being pirated. There is a lot one can do if one comes into possession of what looks like an unlicensed copy of one's work.

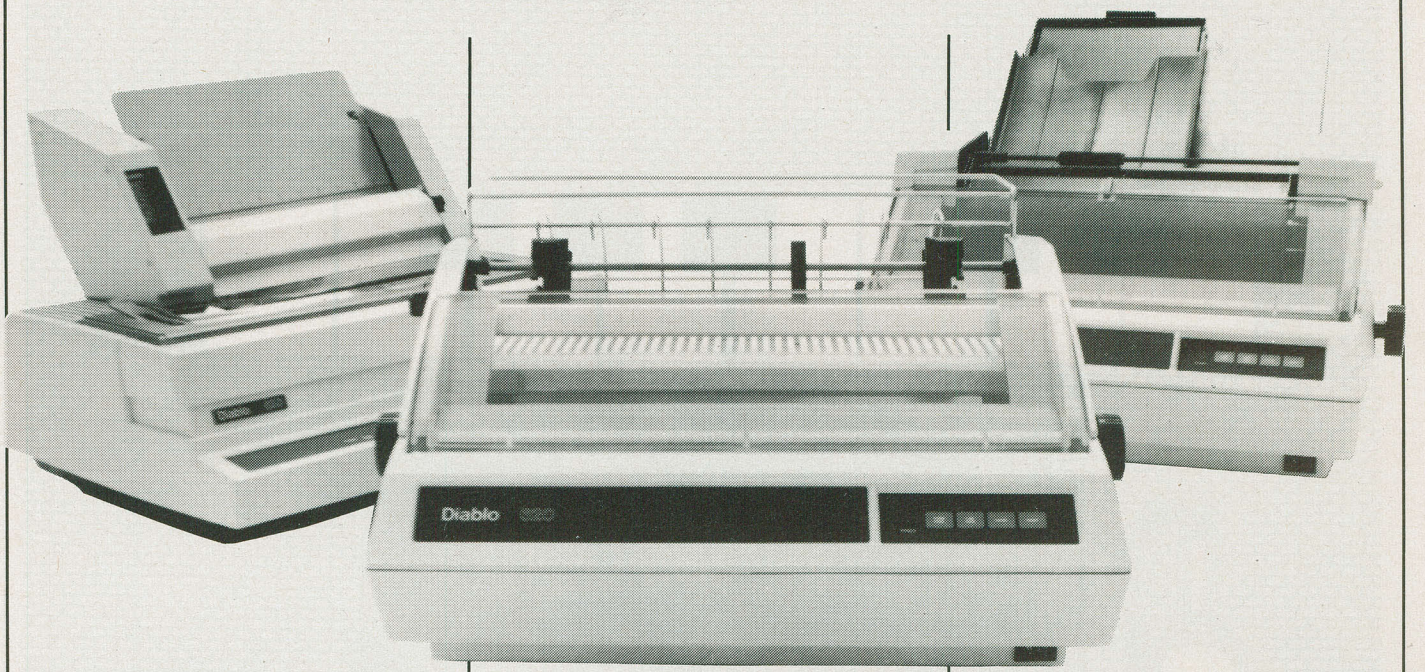
To begin with, one should try to find out where it came from, and attempt to buy another copy from that source. Check the documentation to ensure it is a pirate. Do not make a scene. Tipping off the pirate or seller usually results in the pirate's disappearance or in the destruction of incriminating evidence.

Evidence provides leverage to demand that the offender desist or enter a royalty agreement and pay damages. Threaten a civil suit and criminal prosecution. A criminal suit has the advantage that much work is done by the state, though in computer cases you often have to educate the police. The fees, aggravation and potential punishment and damages place pressure on the other side to settle.

The cash proceeds from piracy may be hidden but money won't help if one is in prison. A suitable arrangement to drop criminal charges in return for a fair civil settlement may be achievable. The deterrent power of visible enforcement should not be underestimated.

A full blown attack is expensive. However, pirates often concede early. Alternatively, if others were victimized, they may agree to provide evidence and split the costs with you. In terms of principle, if you don't stand up for yourself, you can't expect anyone else to protect you. If you only stand up for yourself, you can't expect anyone else to stand up for you. **CN!**

FIVE GREAT REASONS TO BUY A DIABLO PRINTER



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*Datamation magazine brand preference study shows Diablo the overwhelming choice among daisywheel printers. Details available upon request.

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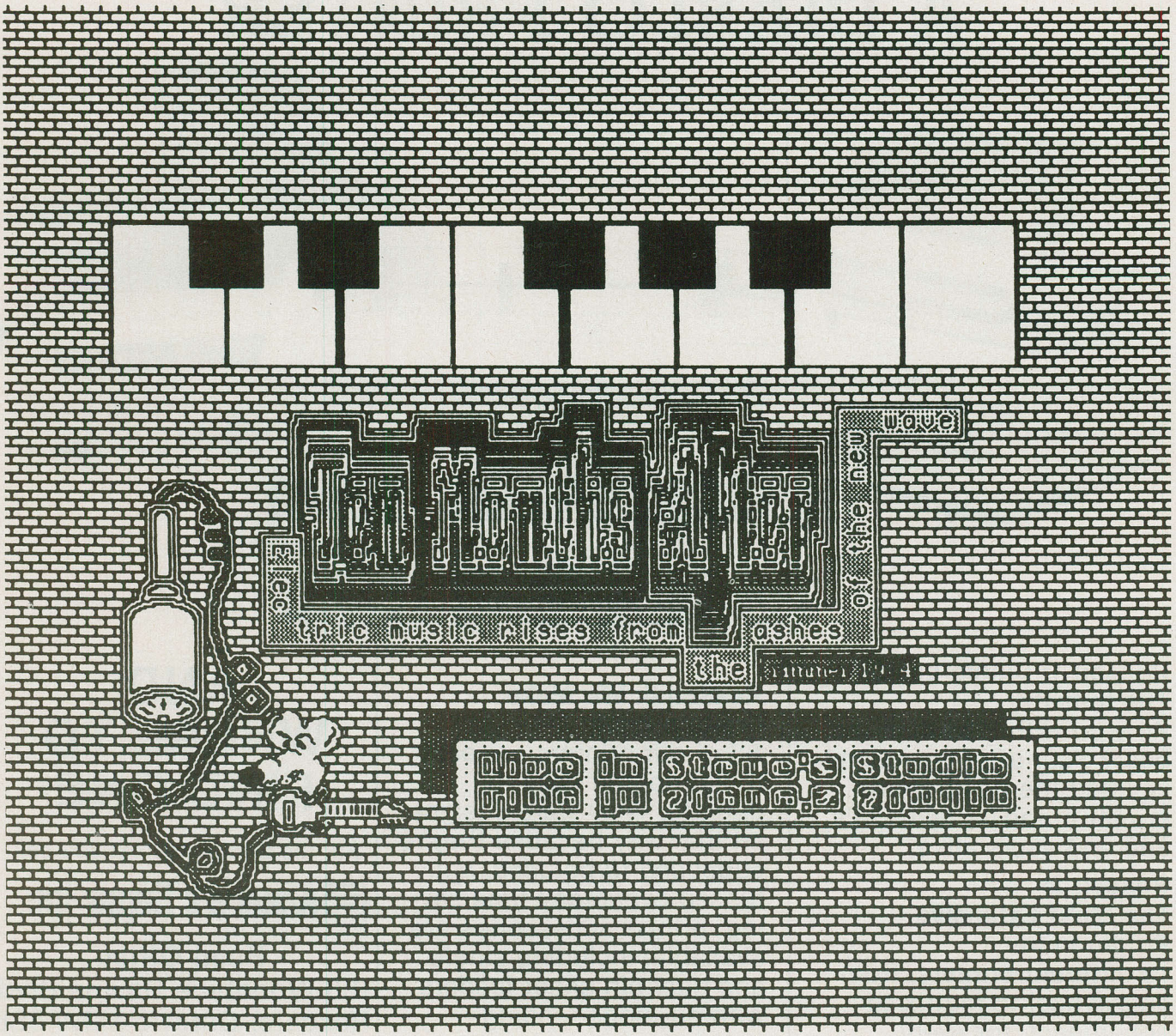
Ten Months After



The power of computer music systems isn't really something one can do more than muse over after a casual play. It's a force that must be lived with, experienced and grown into. Here's a consideration of the art after the warranty has expired.

by Steve Rimmer

Checking out new computer music toys is a trip... but it takes considerably longer than the time gnomes allow for to really get into. A really decent review of something as sophisticated as the Mountain Music cards, the Roland Compu Music or the Classic keyboard wants a year's playing.

Okay, then, at least ten months. It made a decent title.

I am constantly being buffeted about by new computer sound technology. Every so often I take a morning and pilgrimage down to Remenyi House of Music... one of the best places I've come across to check out the tunes... and without fail everything has changed. Greg Stephen, the dude in charge, seems to keep up with it all, but, then, he gets to toodle full time.

It's not surprising that the rest of us get a bit retrograde. Even if you had the bucks to go out and refurnish your studio every few months, you probably couldn't keep up with the capabilities of the stuff. Just about the time you get into something it gets superceded.

Having given over other pages of this issue to discussing MIDI and the state of the art, this feature will look at street level computer music. In it, we'll discuss the moderately affordable, approachable stuff that's been extant for a while. More to the point, I'll talk about the stuff I've been actually using for the past year or so, and what it can *really* do.

All in the Fruit

The newer MIDI hardware can be controlled by any of a variety of things... I think someone mentioned that there was an Atari controller around. In any case, lots of options exist for both the Apple and the IBM PC.

This was not true a year ago, when computer music was almost entirely the province of the Apple II+ and dedicated computer based instruments, like the *Synclavier*. I'm not going to get into the latter area... it's not that applicable, fiercely expensive and not nearly as high tech as even the moderate fruit stuff.

The Apple based sound systems still represent very approachable, playable instruments. This is partially because they have evolved over a few years, and have been nicely refined. The stuff we're going to look at is pretty much the slickest of the crop. Despite its crumpling patina of age, the Apple is a relatively powerful computer, and Apple based music can be surprisingly virtuous.

The nexus of most of the music I've played on the Apple has been a sort of Alpha Syntauri system. This, turning up the magnification a bit more, consists of an organ type keyboard and a set of Mountain Music cards. It is the latter beast that actually makes noises.

The Classic Organ computer music system plays both Alpha Syntauri and Soundchaser software. It allows an Apple to act as a multitrack tape recorder.

The keyboard is actually a Classic Organ system, an emulation of the Alpha hardware... it feels a bit more human than the original. The Mountain cards perform digital synthesis to emulate the action of sixteen computer controlled monophonic synthesizers.

There are two principally useful capabilities of this thing. It can, first of all, be the synthesizer of the gods. In those instances wherein I am doing a tune... excuse me, a *piece*... with a lot of acoustic stuff in it, everything has to go down on real audio tape fairly early in the circus. In other words, one has to approach it as one would any other multi-track recording, laying down a rhythm track, some fill, lead and so on.

Doing this sort of production relegates the Apple to a somewhat minor roll, being simply another instrument. However, it's a pretty hairy one. It can hold sixteen voices at any given time... the user gets to define what the voices will sound like. The voices live in disk files... they're a bit tedious to load, but if one is pretending to be Mike Oldfield and working on one's own, time in blocks of less than a day is a bit of an illusion.

The Alpha system allows one to handle things like split keyboards, provides a metronome through the Apple's speaker and puts up a silly display on the screen to peer at. Actually, the first feature is the most useful in this application.

It is often the case that the more interesting Alpha voices are useful only over a limited range of the keyboard. If one creates a decent sounding trumpet at middle C, for example, it may well sound like a belch down at the low end and a phase shifted sine wave at the top. As such, it's possible to split the keyboard two or three ways... have two or three instruments on there at one time... without losing anything, as one would rarely use the whole keyboard to play a single voice in any case.

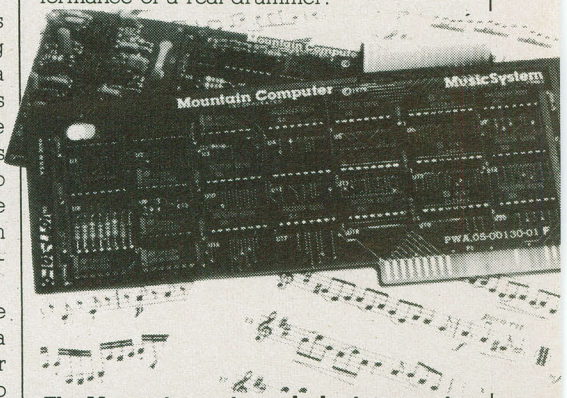
Most of the earlier stuff I got into was along these lines... the Apple was in there, for lead lines or fills. However, there is considerably more to play with.

The Syntauri system has available for it a software package called Metatrack. It's supposed to be a kind of recording studio in silicon and, especially for certain kinds of playing, it actually surpasses this. In essence, it allows one to play one line, "record" it in memory and then overdub a second line while listening to the first one. It allows for sixteen such lines... it acts like a sixteen track tape recorder.

In fact, once you get through the complexities of Metatrack it is a monsterously powerful tool. Simply treating it as a tape recorder is a bit restrictive... one can manipulate the events on its virtual tape in ways that one couldn't begin to think about using an actual recorder.

As I got further into using Metatrack, more and more of the stuff I had been doing with the tape recorder started looking like it could happen on the computer. Guitars remained a problem... the synthetic guitar voices on keyboard instruments are notably unconvincing, as one rarely plays a keyboard like one plays a guitar.

Percussion tracks were also a bit of a hassle, the results in creating them with Metatrack being interesting... but not necessarily a lot like real drums or the performance of a real drummer.



The Mountain music cards do sixteen voice real time synthesis.

Across The Tracks

It's probably true of most souls that start toodling with the bits that there is a kind of oscillation between real and synthetic devices. For a while I was doing everything on the Apple, finally dubbing it to tape when it was right. However, this sacrificed a lot of sound, both because of the limits of the Mountain cards... remote though they are... and because of the potential sonic counterpoint of acoustic and digital instruments which was getting lost.

In addition, the drum track problem was an ongoing mad doctor's experiment, and some of the sounds which I was striving laboriously to make happen on the Apple could have easily have been handled by a Moog type analog synthesizer with a couple of simple patches. The modes of expression of the Alpha package are splendid for many things, but extremely restrictive for a few others.

Flowing back out of the Apple and returning to the outside world, the tape recorder, I got into another box. In fact, I kind of rediscovered it... it had been hanging around, largely unused, for several months. The Roland Compu Music bleeped to life again.

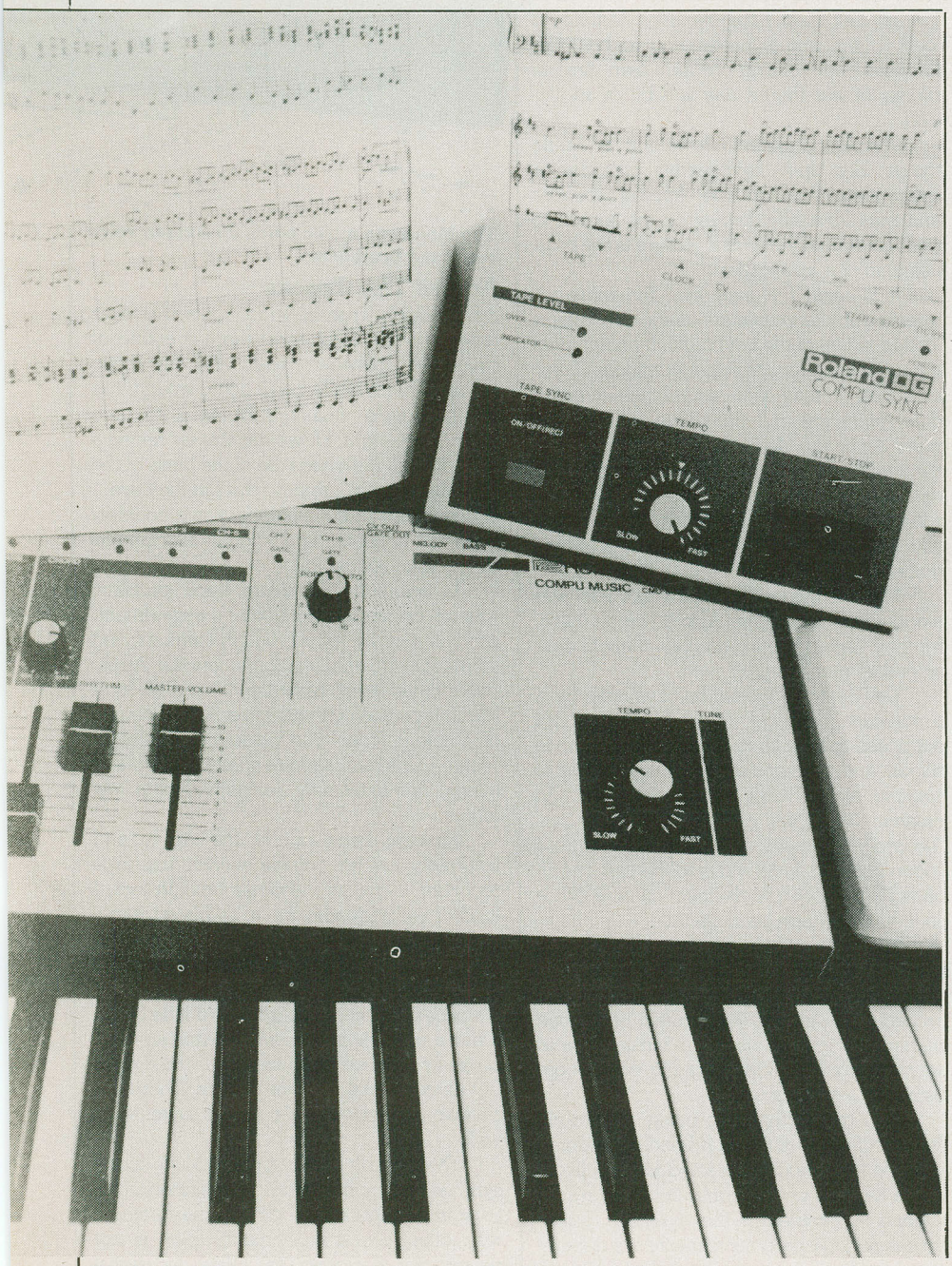
The Compu Music is a weird little box... it has a number of diverse capabilities tucked away in there. It interfaces to the Apple, but all of its vital bits live outside. There are probably interfaces for other systems as well.

The Compu Music contains some sound synthesizers, some drum synthesizers and, most important, some ports for interfacing it with other sound equipment which is not necessarily designed to relate to digital hardware.

Ten Months After

It takes a while to get the feel of the system... it appears to be a peculiar collection of facilities at first. However, it is profoundly eclectic... perhaps "eclectric". The music synthesizers are quite a lot nicer sounding than those of the Mountain cards, although they aren't anywhere near as flexible. The drum system is extremely good, and, what's more, the software which supports it features a very clever drum track editor.

I started out using the Compu Music to produce drum tracks on tape. It's extremely good at this. What's more, it was also possible to have it put down a simple click track on another channel when it was busy doing complex rhythmic things to make it easier to punch into the middle of a piece to overdub a few bits.



The Roland Compu Music, and its companion time controller, provides both synthesis and control of other instruments and events.

The first time I tried to make it do some real world control was when I discovered a lack of appendages during a particularly involved guitar thing. Having both hands on the axe and no spare foot pedals, there came to pass a difficulty in gating the flanger. I popped it into one of the Compu Music's external ports. It was a really lowly beginning.

The Compu Music turned out to be especially good when it was interfaced to an analog synthesizer. At first I used this combination largely for effects, arpeggios and stuff I didn't want to play by myself... or couldn't handle, due to limitations of tracks and hands. It's good for this... you can have it wait for so many bars and then blast a sequence through the synthesizer.

Again, this sounds a bit mundane. However, the sequencing capabilities of the Compu Music far exceed anything that can be handled by any dedicated sequence controller. As such, it can be made to manifest very long or very sophisticated sequences... all without the decidedly mechanical sound sequencers are noted for.

After you play with computer sound for a while... at least, at the level of the Apple... your ear starts to get used to the distortion inherent in digital synthesis. This isn't particularly objectionable... it's just an identifiable characteristic. In fact, it's the result of there being a disproportionately large amount of high order harmonic energy in the resulting noises. The effect of combining digital and analog synthesis in this way, then, is quite effective. The piece has the precision of the computer, something which is decent if it's used properly, but there are flashes of the rough edges of a slightly more primitive sound.

Just the other day when I was down at Remenyi, Greg had a number of new boxes which interfaced to the Compu Music. While it's a good little banana all by its lonesome, there has been some thought given in its initial design to make it expandable. There was a creature, for example, which gave the user external control over its clock, allowing one to punch it in and out of a piece and to vary the speed of what it was doing with a bit more precision than its own facilities allow. However, the most interesting of these things was a stand alone analog synthesizer module all set to patch into the Compu Music and wail.

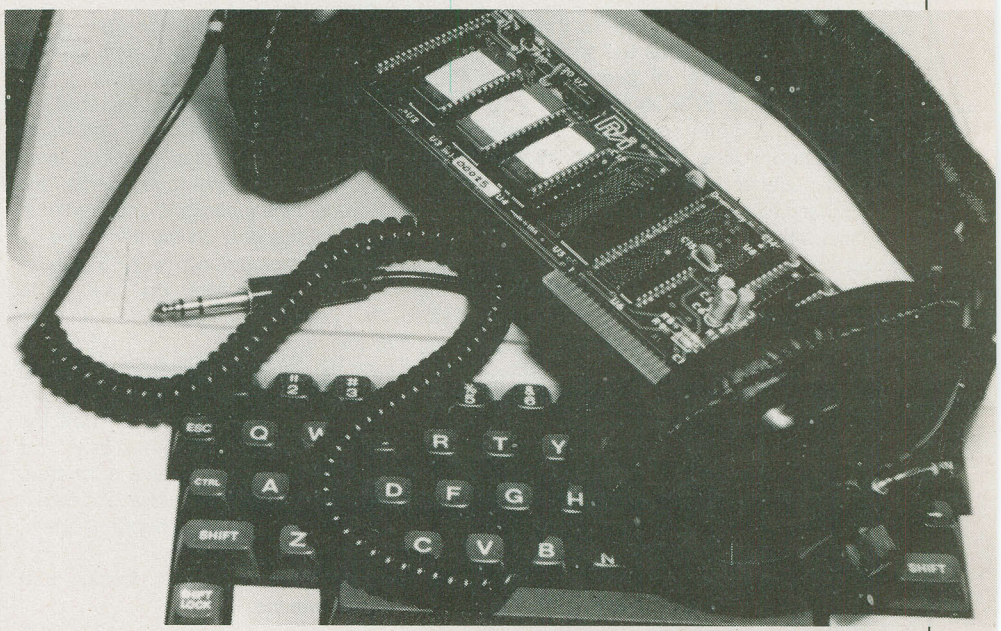
Remenyi has also developed a new driving software package for the box, allowing it to interface with a number of new controllers, such as the Alpha keyboard and the MIDI bus. I haven't had a chance to try it yet, but it should vastly enhance the capabilities of this already profound box.

Clock and Roll

Even with the Compu Music, the biggest hassle remained drum tracks. The existing stuff was good, but the Compu Music lacks a wide range of drum sounds. It's fairly easy to fill this in, by using an external synthesizer gated through the Compu Music, but this got to be a bit cumbersome, especially if I was using the Compu Music for one of its many other trips.

Greg said that what I needed was a Drumulator... a very sophisticated computer compatible stand alone percussion box... an idea I could really get into. I have one on my shopping list, right after I get the Rolls paid off.

The solution to this showed up one day on a slab of fiberglass and a manual which proclaimed that this was none other than the PVI Drum Card. Plugging into an unused slot of the fruit... there aren't very many of those left any more... the PVI card turned the box into the best drum machine you can get without a bank loan. It's a bit unusual, at



The Peripheral Visions drum card holds real drum sound digitally synthesized in EPROMS, producing the last word in realistic sounding percussion synthesis.

Ten Months After

least as computer music goes, as it doesn't synthesize anything. It has the sounds of a whole drum store full of percussive toys digitally stored in EPROMs, and it pops them through a digital to analog converter on command. Ultra slick drum software steps the patterns out on command.

It's hard to say what's better about the PVI card... the startling clarity of its sounds or the brilliance of its drum track editing software. However, the whole works goes together to do some pretty decent stuff. While playing it pretty well demands the use of a tape recorder, rather than a RAM based system like the Alpha, for even middle level track manipulation, its overall good karma makes it worth the effort.

What's more, the PVI card will be pleased to generate a sync pulse through the Apple's game port, allowing it to re-interface with other things... like the Compu Music... by having it sync them as its sounds come off the tape.

With a decent resource of drum noises available, I started getting into some fairly strange rhythmic things. While I can't play bizarre times on drums, I certainly program them. Again, the juxtapositions of two unique musical forms... in this case precise computer music with strange meters... can lay some really fresh sounding noises on the tape. It can also leave you with miles of cosmic mud... the closer one leans toward the edge the harder it is to get life insurance.

There comes a time, in playing with all this stuff, that it all starts coming together. This moment takes a long time to reach... which is why I'm writing this piece a long time after having acquired the toys. If you go into a music store and buy a computer music system you'll be doing it largely on faith. I don't think anyone can begin to see the potential of his or her own stuff reflected in an instrument this complex without several months of playing.

That is the cusp of it... when it all comes together these diverse bits of hardware and software will play as a single instrument. This is not a physical thing, in that only a bit of the hardware I've been talking about can be interfaced to other things at the computer level. Rather, it's conceptual on the part of the performer.

Making computer music into a playable thing, a useful instrument rather than a music box to impress the cat with, takes a lot of intuitive understanding of the capabilities of the various devices. This, in turn, takes a lot of playing. Unfortunately, it takes a lot of unproductive playing before one can start doing worthwhile stuff.

The ultimate power of computer sound, even beyond its ability to create virtually any noise in the known universe, is the potential for a single human to control all of this stuff with a single pair of hands.

You can get your tracks together, all stored there in the bits and bytes of Metatrack, and then start mixing them down. Now, in traditional tape mixing, one could change the equalization or the volume of a track but the stuff on the track, the instruments and the voicing, were all pretty much cast in glass unless one wanted to drag the performers back in and have another shot at it.

Using the Apple it's possible to go along mixing the stuff down and change the instruments on the fly just to see what the piece would sound like with subtle... or radical... changes. Track three is a trumpet. Wonder what an oboe would sound like... zap a few keys and the thing happens again, with an oboe.

Mixing down computer tracks is a spiritual experience.

Much of the stuff I've talked about in this feature can be had from Remenyi House of Music. Anyone even casually interested in computer music should try to have a hike down there. There's a good sub shop on the corner, too.

Among the stuff available at Remenyi are Alpha Syntauri keyboards, the Mountain Music cards... as seen in the June 1983 edition of Computing Now!... the Metatrack software, the Roland Compu Music and its growing litter of appendages... the basic box was scrutinized in the October 1983 edition... and considerably more stuff which we haven't looked at in this feature.

Remenyi was at 210 Bloor Street West, Toronto, Ontario M5S 1T8 1-416-961-3111 last time I saw it, and, unless the continental drift has moved it, it probably still is.

The Classic Organ keyboard is available from Classic Organ. You'd expect that. We had a detailed look at it in the September 1984 edition. Classic Organ can be found at 300 Don Park Road, Unit 12, Markham, Ontario L3R 3A1 1-416-475-0280.

Finally, the PVI Drum card, just returning from a successful road show in the July 1984 edition of this very publication, is available from Peripheral Visions Incorporated, 1 Great Valley Parkway, Malvern, Pennsylvania 19355 1-215-647-3930.

Digital Orchestra

Greg Stephen sat on a footstool in the glass room where his computer sound toys live at Remenyi. He held an album jacket that looked like a giant floppy disk and two shiny silver disks... a pair of record stampers. It was the penultimate symbol for a recent project, the recording of the New Digital Orchestra, of which he is a member. The album was recorded entirely using computer music equipment.

"This is going to be the album in a while..." he began. The two stampers slipped out of his hands and clattered across the floor in metallic counterpoint to the Mozart burbling from the MIDI. He retrieved the disks. "These aren't the actual stampers we're going to be using, by the way..." he added.

The stampers for the album look a bit different than those for most of the plastic that gets shrink wrapped, in that at the centre of the disk, after one's stylus would normally have slipped into the dead zone and started clicking, there is a wide band of tracks. They don't contain music, though, or, at least, not in the normal representation of it.

"These are the computer tracks for the music on the album." Greg explained. "You can take this record home and play these tracks into your computer instead of these other ones going into your speakers. With these tracks you could listen to the piece exactly as it was performed."

In fact, there is a lot more to the concept than this. The tracks are like musical source code. One could alter parts of the pieces to suit one's taste, change the mix or analyse the performance for the technique of the players.

While still a bit leading edge by the standards of many listeners, the New Digital Orchestra album, when it finally hits the racks, will be a pretty decent capsule description of the power of computer music. It allows one almost limitless control over sound, even months after the fact.

The newer computer music stuff that's arisen, the MIDI based hardware looked at elsewhere in this issue, is considerably more powerful than much of the Apple based stuff I've talked about in this article. However, it's also a lot more expensive and much thicker to get into. The Mountain cards, the Classic Organ keyboard, Metatrack and the Compu Music are still very viable instruments. I continue to be impressed by what they can produce when I'm not expecting it.

Playing music is a bit of a tightrope act between discipline and self indulgence. The first element is solely the province of the player... the latter always limited by the instruments he or she has available. Computer sound pushes back the limits of self indulgence by a couple of light years...

The agony of disciplining one's self in the face of it... at four in the morning after a good thirty hours of toodling... is almost insurmountable. **CN!**

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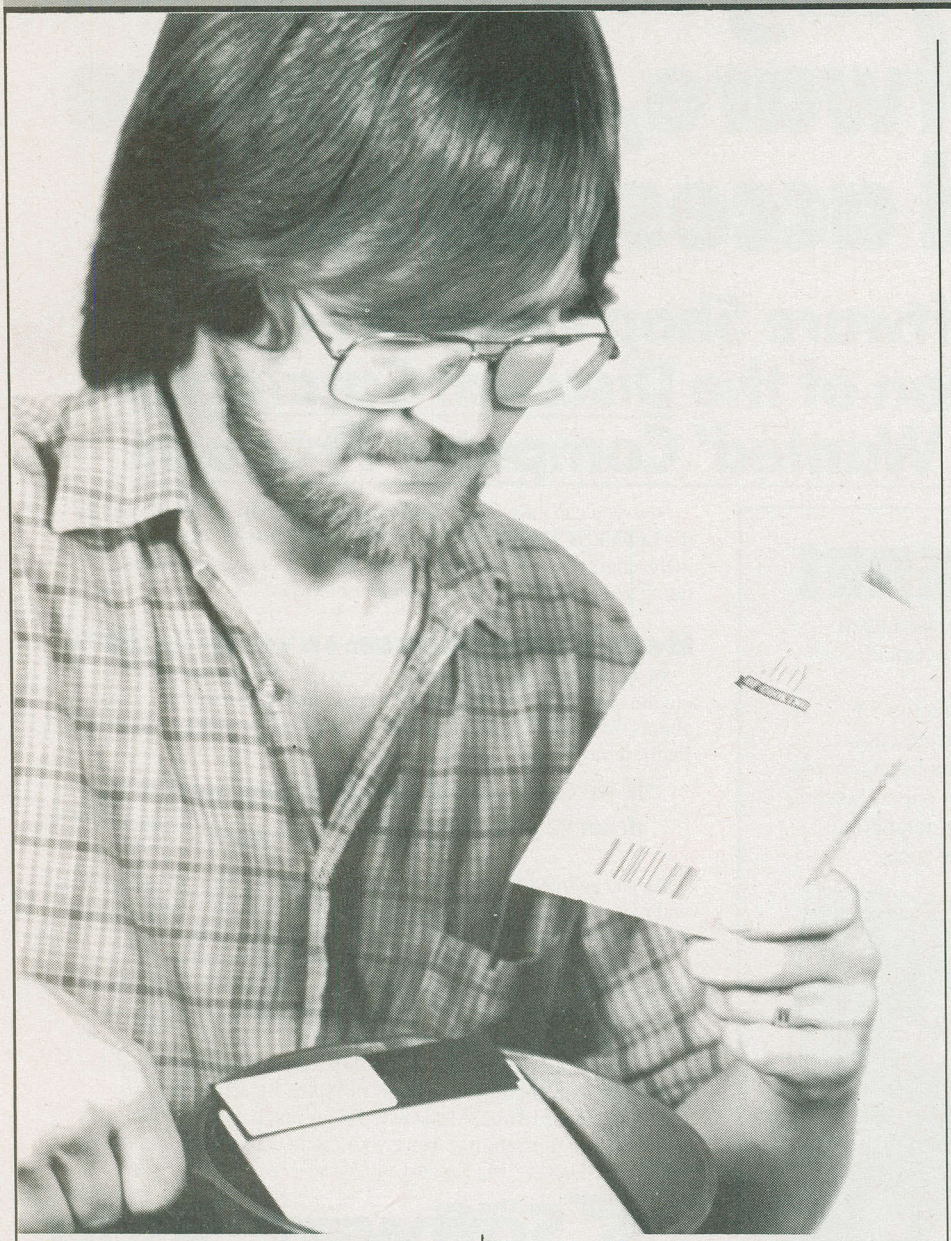
Great Ways to Fry a Floppy



Floppy disks are among the most helpless and easily victimized parts of a microcomputer. For all the fiberglass sadists and silicon dementos out there, here's a look at the best methods for making a disk check out.

by Steve Rimmer

The computer industry is a bit McLuhanesque... it has a lot of global icons. There are all kinds of things that we regard as being symbols of what all this stuff really is. Among the ones that crop up a lot at the moment are IBM keyboards, video displays and, of course, disks.

Disk drives are among the most fundamental components of contemporary microcomputers. While there are a number of alternatives to floppies, these are generally seen in conjunction with these greasy little toys, rather than supplanting them. Floppy disks are turning up on sale in supermarkets, and rare is the shopping centre that doesn't offer a wide variety of them.

Floppy disks are also the fundamental source of hassles involved in using a computer. This isn't that hard to understand... if you really get to understand how a floppy works you'll begin to wonder why the things function at all. There is a lot of witchcraft happening in those drives.

The reality of the situation, however, is that despite their inherent propensity for croaking all by themselves, most users succeed in doing in their floppies to a reasonably large extent too. It's not that hard to offend a disk or the drive thereof... think of the average five and a quarter inch disk of having the disposition of the Ayatollah Khomeni with a migraine headache.

This article will look at some of the best ways to shorten the useful life of a floppy disk. There are a lot of good reasons for doing this... for example, one of the best sorts of copy protection is to simply render the disk unreadable. We'll stay away from the obvious ones, like grabbing the mylar with your sweaty palms. There are so many more subtle ways to snuff one of the little freaks.

Of course, I realize that not everyone is into these esoteric sports. That's okay. If you weren't aware of some of these techniques you may find that you can use this information to some advantage in other ways, such as to *avoid* blasting the disks you really do want to keep.

Mud Slide Slim

On about the third computer I built I actually decided... for reasons I can't begin to remember... that I'd read some of the documentation which came with a number of the more expensive parts. I spent over five minutes on the specification sheets for the 2791 disk controller chip, a one hundred and twenty–five dollar silicon slab at the time, and a disproportionate half hour for the books that came with the drives.

The books for the drives were quite interesting. I found out about all sorts of things I'd been doing wrong, and promptly forgot almost all of them, since disk drives are very forgiving when they're new and whatever I was doing seemed to work.

One of the things I forgot until just the other week was a paragraph in a large black box which said that drives could be vertical... or horizontal... but shouldn't be anywhere in between. This seemed a bit unlikely to me then, and since I wasn't into avante garde microcomputer design at the time, and didn't fancy the idea of having the drives glued to the side of a pyramid, I didn't give it much thought.

Just the other day, after we'd settled into our new cave and I'd had time to get the one eyed monsters up again, I began to experience quite a number of nasty drive errors. As it turned out, this was as a result of a table made of pressed sawdust from Beaver

lumber, which was sagging in the middle. The drives, which were are one end of the table, were about five degrees off horizontal.

Deftly placing a copy of the Grateful Dead anthology under the lower side of the drives, I returned them to a single astral plane. All the errors went away. It was like a sign from the gods. I trundled up the trusty Dumont 304A oscilloscope we use to tune up the Oldsmobile. It's a turkey, but you can see the drive waveforms on it. Sure enough, if the drives are moved more than a couple of degrees from where they should be everything starts to get wrangy.

The reason for all of this is in the minute size of the tracks on a disk, the fairly funky construction of many drives, especially the imports, and the widening tolerances of the mechanical components of said drives as they age and get a bit worn. Given the unexpected force of gravity, the drive can start putting its head down where it isn't meant to. Actually, many drives will work fine in this condition for indefinite lengths of time... provided they aren't asked to read or write to tracks which were laid down when they were in other positions, or by other drives.

Cheap 'n' Nasty

The best way to insure that one's cat won't be a nuisance too long is to buy one which is about fifteen years old and then just forget to replace the battery in its pacemaker. This is also true of disks. If you really revel in the sound of gronching drives and chattering heads, and love the thought of all those slimy bits of data being lost for all time you should buy the cheapest disks you can find.

With a bit of experimentation it's possible to find disks which are almost dead when you first rip off the shrink wrap, and go lightly downhill from there.

There is a vast range of quality in floppy disks. I originally didn't believe this, because they all seemed to do roughly the same things. However, if you engage in anything which entails a lot of disk accesses, the quality of the disks you buy will be of some import.

The process of making disks is a pretty exacting one. However, in order to manufacture them with some margin for profit, the mylar slabs in disks are handled just like any other high technology device. They're sorted. The stuff comes up from the caves of the nether trolls where it's forged... at least, I think that's where it comes from... and it's checked out for its ability to retain data. The really super stuff becomes doublesided quad density disks. The rejects get sorted for double density, and then for single density. Anything that burps during the single density sort becomes place mats.

Obviously, the profit in making disks is determined by how much of the mylar that's produced actually turns out to be useable. This, in turn, is determined by the standards set by the dudes selling the disks. Some of less expensive disks get that way because their manufacturers allow for more errors in the plastic.

Cheap disks may come with errors, but it is more often the case that they sprout them later on. The reason for this is tied up in the way one sticks the oxide of the disk onto the mylar that keeps it from being just

Great Ways to Fry a Floppy

dust in the wind. The better binding agents are much more difficult to work with. They produce fewer useable disks and, therefore, more expensive stuff.

Finally, the mylar itself is tricky. You see, it gets hot inside a disk drive, which causes the mylar of the disk to expand. This, in turn, moves all the tracks outwards, causing the operating system to think there are disk errors happening because the tracks aren't reading any more. More expensive mylar formulations have lower coefficients of thermal expansion.

The really grotty cheap disks are exceptionally horrible. I had a box of generic no name diskettes from one of the supermarkets a while back that was a real slice. Four of the ten formatted, and none of those survived for more than a few hours. They also managed to plaster the drive heads with nameless ferric substances.

The moderately priced disks aren't bad, especially if you aren't going to do much with them. The double density ones work well for single density storage, and they're cool under things like Apple DOS and Commodore BASIC, which aren't too demanding of their plastic.

Having been burned several times, we use really good disks here. Spare no expense... it's the company's money. We all figured it was cheaper to pop for Maxells, Verbatims, Axioms, Dysans and similar extravagances than lose a day's work to the ever lurking BDOS error on B.

Mindrot

One of the best ways to kill disks is not to clean the drives. This works insanely well, perhaps more so than anything short of a hammer if you give it long enough. It works best with the aforementioned cheap disks, which can actually do in hours what simple neglect would take weeks to accomplish.

Even good disks will get your drives dirty. While one thinks of the oxide layer on a disk being about one molecule thick, it's considerably denser. It's not all that easy to get the stuff to stick to the mylar, but it's still more of a problem to get it to stick to itself. The binders that are used in disks tend to get a bit brittle and sleazy after being cooked in a hot drive for a while.

The result of all this is that the oxide can flake off the disk, sometimes without even losing any data, as it's often the case that only part of the layer will hurl itself into the great unknown.

One would think that any loose particles of oxide present on the disk would get spun off the surface or become trapped in the fluff inside the disk, but this isn't, in fact, what comes down. The flakes collect on the drive heads because this is the place where they can be as destructive as possible. After a while the layer gets thick enough and the head starts missing data.

Disk head cleaners abound... you should avoid these at all costs if you really want to total your disks. The disk manufacturers suggest cleaning the heads of a drive every hundred hours... this is purly foolish, as talking you into not cleaning them at all would allow them to sell an awful lot more disks.

Among the disk cleaners to avoid... ones that work extremely well... are the one shot packages from Verbatim, as distributed by Computroniks. These are disks soaked in carbon tetrachloride that you run in your drives for a few minutes to scrub them clean. Vividat is a similar device... specially designed in Canada for use by beavers... distributed by Griffco Marketing, which consist of whole bottle of carbon tetrachloride and reuseable cleaner disks. Likewise, Precor distributes a package from Denmark called CDC... it's the same sort of trip, replete with executive looking black bottles of chemicals, available for both five and eight inch disks. RSI Computer Care Products, distributed by Budgetron, produce a similar kit for drive cleaning, as well as an overall computer care kit, which includes anti-static spray, a screen terminal cleaner and a drive cleaner.

Power Downers

Few things are more satisfying than the magnificent destruction of a disk through a power glitch. These ecstatic occurrences are caused by all sorts of things, including line noise, inductive surges and just plain dirty power.

It's not difficult to understand how something like this comes about. A power glitch can completely unravel the microprocessor working the disk drive at the moment of a disk access. On more recent drives, this can result in having the thing place a sector very nearly anywhere, wiping out part of your directory, for example.

Inductive spikes, largely the nastiest of the power line trolls, can be caused by all manner of things. There are the ones that come from motors starting and coffee pots coming on. If you live in an apartment or a condo, keep in mind that blowers and elevators are really ruthless for having old, crotchety motors.

It's surprising how much electrical noise can survive line transformers, miles of cable and even the things that are designed to trap them. Spikes which are several thousand volts high will quite regularly come cruising down the line, walking through everything in their paths. The spikes themselves are often only a few nanoseconds wide but after this has a chance to get onto the system bus it can amount to several dozen machine cycles... ample time to gorch out even the most resolute drives.

There are ways around this, if you must. Uninterruptable power supplies are good... they run your computer from a car battery, using the AC line to charge the battery. These are cumbersome, expensive and, most important, full of battery acid. Battery acid is a drag.

More reasonable is the application of a power line filter, such as those made by Tycor. These things work pretty well, taking out all but the biggest spikes, and punching those out enough so as to have them get lost in the power supply of your system.

Another first rate source of electrical glitches is static electricity, which will do in most drives at the least likely moment. The results are about the same as those of power line spikes, except that static spikes are invariably longer, hotter and far more catastrophic.

Static electricity is a larger hassle in the winter, when the air is dry. Antistatic mats, such as the ones done up by Carlyle Computer Products, work... those fifty dollar humidifiers from Sears are also decent investments into the future of your data. If your space is really dry you might want to inculcate everyone into the habit of not touching the computer when the drives are being accessed.

Shaving everyone's head and shooting angora sweaters where they stand are, perhaps, extreme solutions. On the other hand, having the occasional visitation by ball lightning can liven up an otherwise boring week.

Great Ways to Fry a Floppy

Up In Smoke

The final disk destructo we'll check out is one which is especially neat because it's subtle. Air pollution will do in your floppies, but it will do it slowly.

The space between the head of a disk drive and the mylar below is infinitesimally small. Such it is that if anything makes it between these two surfaces something is going to have to give... this will invariably be the oxide, which is the softest thing in the party.

There are all sorts of substances and etheria that can make it between the head and the disk. Dust, particles of things, pollen... pollen is a trip, because it's hard and usually very pointy. Check out the accompanying electron microscope snapshot. A good dose from the chrysanthemums in the hall may drag around your pet data for several tracks.

The effects of large particles can be exacerbated by the existence of much less substantial things, like cigarette smoke and fumes from petroleum distillates. These things can be quite corrosive... at least at the molecular level... softening up the surface of a disk even more so that mother nature made it, leaving it open to onslaughts of larger beasties.

There are a number of things you should not do if you are looking to destroy your disks in this way. Air cleaners, for example, are right out. Those Phillips *Ecologizer* things are not much good at cleaning up the whole house but they'll suck in the effluvia from an ash tray if they're near by, thereby largely disarming much of the splendid erosive elements of an otherwise good cigarette.

Vacuuming out the room where you work with your computer will trash out a lot of the dust that might otherwise get onto your disks.

Forced air oil furnaces put quite a lot of reasonably corrosive soot into the air. If you have one of these things about, an electronic air cleaner in your computer room is a worthwhile trip.

Diskusting

The difference between floppy disks and people is that dead floppy disks are extremely useful, whereas dead people can't find work outside of politics. A floppy that won't hold data is eminently suitable for an archery target, throwing at things, making into a mylar card house and fashioning into modern sculpture. This is for poorer computer users. The more affluent ones can afford to use disk drives for sculptures... Apple, for example, recently welded together a whole pile of their never used "Twiggy" drives and put the resulting object in the courtyard of one of their Cupertino offices.

It's actually very simple to fry a floppy if you want to be brutal about it. However, a modicum of subtlty makes the whole experience richer and more vital. Users who have a warped notion of computers, and would rather avoid disk errors rather than bask in their profuse flowing messages can also be subtle... even if they don't know what they're missing. A bit of thought about how a floppy disk actually works, and what's involved in sending its data into the twilight zone, is usually enough to keep it out of trouble.

Now, get the Whimshurst machine going... burn a couple of cords of wet poplar in the middle of the room... blow a couple of fuses... crack open the disks from Taiwan that you've been keeping in a drawer full of moldy sweat socks... can't you just feel a thundering tide of error messages coming upon you...

It's glorious. **CN!**

This is pollen... which should explain why it's so nasty.

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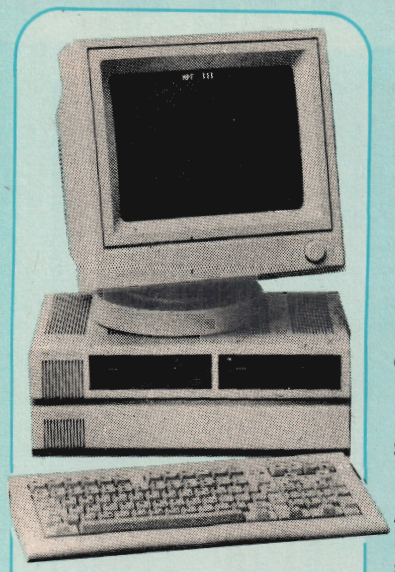

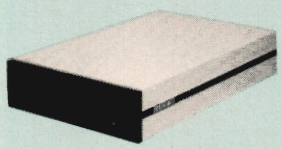

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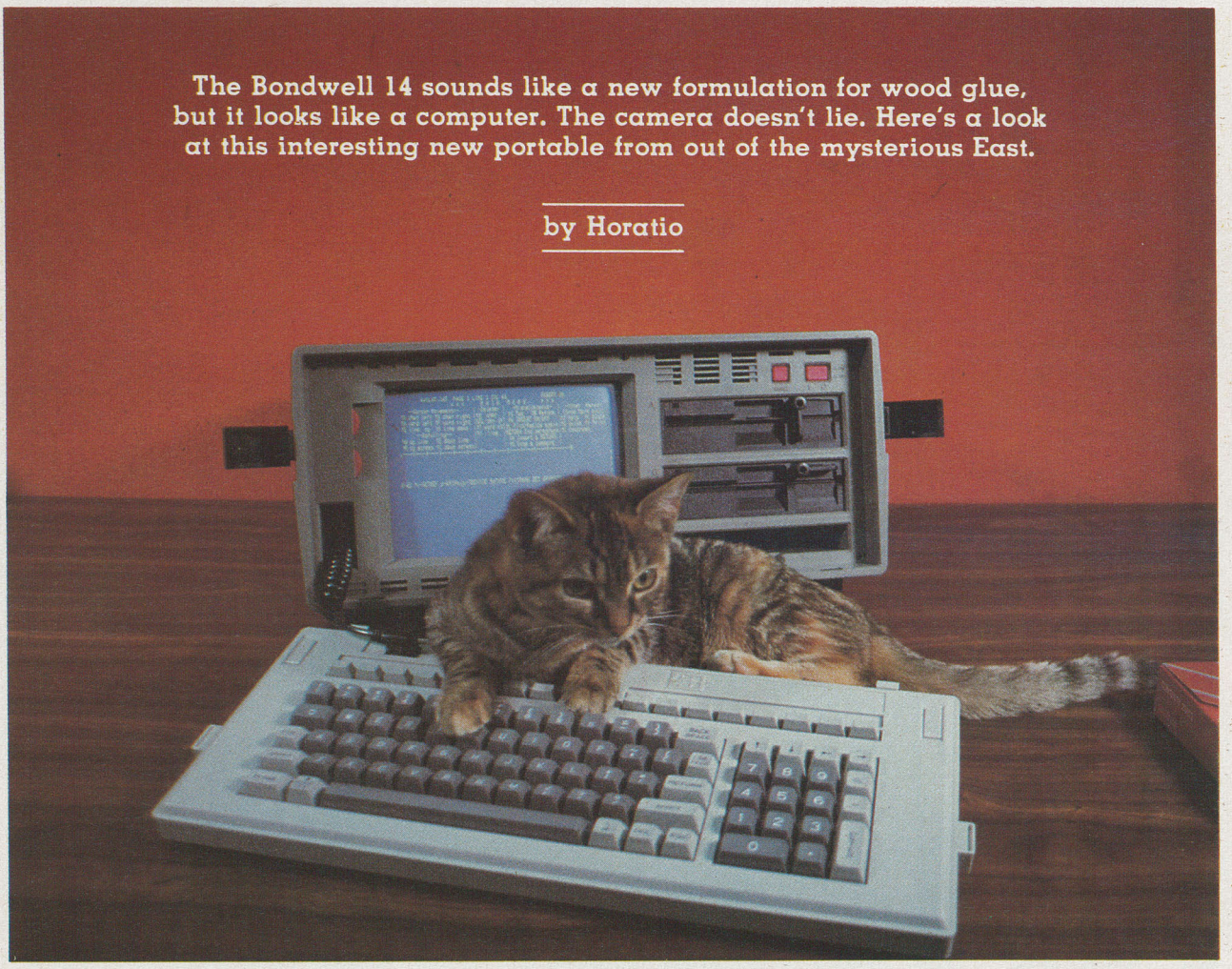
Bondwell 14 Review

The Bondwell 14 sounds like a new formulation for wood glue, but it looks like a computer. The camera doesn't lie. Here's a look at this interesting new portable from out of the mysterious East.

by Horatio



Humans are peculiar... for one thing, they think they have a monopoly on being able to type. This is largely fatuous. A lot of things can type. I'm given to understand that some lawyers are learning to do it.

They are equally as deluded about being able to read. I'll have you know that there are a lot of cats that can handle reading. We don't... at least, not normally. No cat *wants* to be grilled under hot lights for a thirty second appearance on Believe It or Not.

I'm sure that when they check this place out at night they expect me to go crash out in that stupid cat bed they bought for me out of petty cash or chase mice... one of these days I must mention to one of them that I slaughtered the last mouse around here months ago. I do like the Mac mouse, though.

You can't live in a place like this for very long without getting infused with computers. I counted them one night when there was nothing on the tube... there are fourteen of them in this office alone. If they spent a tenth of the money they spend on computers making me comfortable... me, a living, breathing, eating creature... I wouldn't look like a hairy skeleton with odd coloured paws.

You can't tell humans that, though. You can get awfully sick of no name cat food.

Glue

The latest computer to wheel into this place was something called the Bondwell 14. It looks like the Osborne they used to have, except that I can sit on top of it without the case caving in. In fact, compared to some of the portable systems they've dragged through here, it's extremely rugged.

By the look of things, it's also among the heaviest. While it has a handle, the humans move it around with a box trolly whenever they can. One of them said that "you can make a twenty-six inch colour TV just as portable by sticking a handle on *it* too."

Unlike most of the computers I've seen lately, this one isn't an IBM compatible at all. It runs CP/M Plus. However, it does so in a hundred and twenty-eight K of memory, so it's not just another old style box. In fact, for most of the things I like to do with computers... I've been working on a novel, you know... I found it to be preferable to the sixteen bit machines. It's faster, for one thing, with a clearer display and a much, much better keyboard.

Being a cat, I am forced to type using the two paw hunt and peck technique, so, naturally, I'm rather sensitive to keyboards. The IBM style deals are so light and uncertain that it's hard to know when I've hit the right keys. The Bondwell's effort, on the other foot, is a good, solid older style keyswitch type, not unlike that of an Apple. It has a generous allotment of sixteen programmable function keys. It also features all

of the usually ignored keys, such as a delete key for WordStar, curly brackets for programming and so forth. There is a numeric keypad as well.

The screen is, likewise, a well considered effort. While it is small enough to fit into the portable case, it is still big enough to be comfortable... probably even for a human. Furthermore, it's amber, rather than green, making it less tiring to the eyes. It's not as sharp as the screens of some other portables, however... such as that of the Zorba... a moderate distraction.

There are other immediately interesting bits of the Bondwell. It comes with two double sided double density drives, holding about three hundred and sixty K each. They'll read and write data in the Osborne and Kaypro formats, making it easy to get software for the thing. There are two RS 232C serial ports and a Centronics type printer interface under a cover at the back of the machine.

It's a bit heavy as portables go, but then most portables are considerably heavier than the briefcases they're intended to replace.

The cover for all the connectors is a particularly good idea for a portable. I recall the humans beefing about some of the other machines, which would have their interfaces all full of mud, grass, carpet or cat food if someone deposited them in the wrong spot for a few minutes.

The Bondwell also does graphics. They aren't really superb graphics by the standards of a PC... they turn up as a one hundred and sixty by seventy-five array of blocks... but they can render passable pie charts and graphs. However, none of the included software outside of the demo package allows one to make use of this facility.

There is one... ahem... more feature of the Bondwell which I should note. You could say it speaks for itself. Some cat hating human in Hong Kong decided to endow the Bondwell with a speech synthesizer.

Listen, I was playing with the software and I found a program called SPEECH. It being three in the morning and the TV being unusually dull, I ran it. There are cat claw marks on the ceiling the humans are still trying to explain.

It's hard to know how to describe the Bondwell's speech facilities. Phrases like "awful", "agonizing", "worse than no name cat food in July"... these don't really convey the full magnitude of the thing. We have had several low cost computer voices in here, such as the Echo II for the Apple, and they are bit robotic, to be sure... this thing sounds like a Datsun begging for a quick painless death. It's barely understandable.

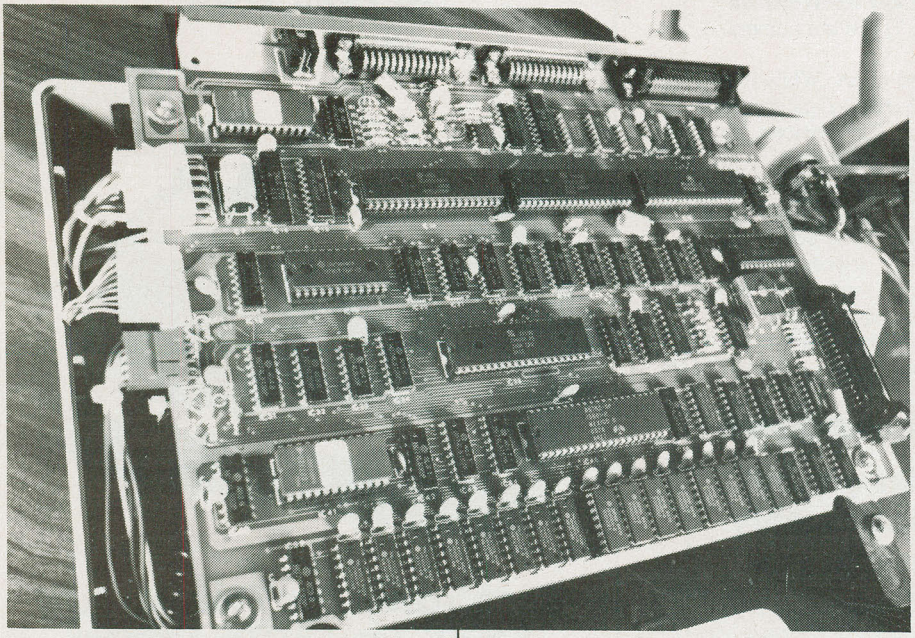
Imagine Elmer Phud imitating a Dalak and you'll have a reasonable idea of what it's like.

The speech synthesizer is much like the graphics, in that none of the software which comes with the package supports it. As such, it is easily ignored in using the otherwise fairly decent Bondwell.

Heavy Bundle

Using the Bondwell is much like turning on any other computer. The keyboard unclips from the front... fortunately, one of the humans had left it like this for me. There are plastic feet that snap

Bondwell 14 Review



plastic feet that snap down to prop up the keyboard at a comfortable angle and, likewise, feet to elevate the front of the case.

The machine likes to check itself out every time you switch it on... including a complete memory test. As such, it is a little slow in booting. If it fails in its floppy disk test... such as discovering that the drive door is open... you have to turn it off and count to ten... hitting the reset button won't work at this stage. Both switches are located in the front panel.

The Bondwell comes with an unusually generous bundle of software... it looks like a catalog from MicroPro. It also features the CP/M 3.0 operating system stuff and a plethora of utilities.

It's probably worth starting with the simplest stuff. The humans say that CP/M 3.0, or CP/M Plus, is an enhanced version of regular CP/M 2.2. While this doesn't make a lot of difference to the user... it behaves almost exactly as does regular CP/M... it offers programmers features which regular CP/M does not. As such, programs for CP/M Plus based systems can be tighter and faster.

Regular CP/M programs will, however, still run on the Bondwell.

The files on the two system disks which come with the Bondwell are a rather odd collection. There is, first of all, a collection of the source files for the system BIOS. There are also the system's operating system object files there... part of the CP/M 3.0 operating system code lives in an external file which one must be sure to copy when one is making a new operating system disk.

Specs

System:	**Bondwell 14**
Processor:	**Z–80**
Memory:	**128K**
Operating System:	**CP/M 3.0**
Graphics:	**160 x 75 pixels**
Display:	**9" amber monochrome**
Disks:	**2 DSDD 360K floppy**
Distributor:	**Spectravideo Canada**
Manufacturer:	**Bondwell Computer**
Price:	**$2695**

There are also some machine language tools. There is, for example, RMAC and LINK to allow for reassembly of the BIOS. There is also MAC, for simpler assembly programming... but no corresponding LOAD program... making it a bit useless. You can actually load programs using SID, which is provided, but it's tedious.

There are no higher level languages, such as BASIC, provided with the Bondwell.

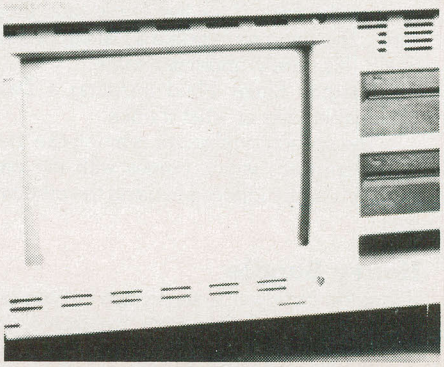
The business software which comes with the package is rather more impressive. It includes WordStar, MailMerge, CalcStar, ReportStar and DataStar. SpellStar seems to be notable by its absence... a pity, as few cats can spell all that well. This is likewise true of humans, who can never get the words "crab meat" to come out right on their shopping lists when it's time to feed me.

All of the application packages are CP/M Plus versions... they run nominally faster than do the regular CP/M versions, and quite a lot quicker than do their MS–DOS counterparts.

WordStar is, of course, the world's most popular word processing package. It's particularly decent to use on the Bondwell, as the machine's control keys emit the appropriate characters to manipulate WordStar's cursor and because the programmable function keys can be set up to do common control sequences.

The WordStar manual which comes with the Bondwell's package is one of the best I've pawed through... a far meow from the older style ones which were done on a dot matrix printer. This book has a complete tutorial section and plenty of examples. It also has some pretty dippy cartoons splattered through it, but, then, you have to expect these things of human beings.

WordStar interfaces with the MailMerge package to allow one to generate form letters an individualized mass mailings. While I didn't try to do any mass mailings with the machine... the postage meter is locked up in the other building... I have seen the humans use MailMerge in the past. It produces junk mail at an impressive rate, and Attila, the post office's cat across the street, says that his humans are extremely pleased it is so widely available.



The bundle also includes CalcStar, a spreadsheet package, which the large fellow in the Bach costume elsewhere in this issue... he actually owns the place... says is the worst sort of turkey. He uses a lot of spreadsheets, and frequently speaks disparagingly of this one for its command structure and its lack of useful amounts of memory. The memory, while less of a problem on the Bondwell, having a hundred and twenty-eight K, still only allows of slightly over seven hundred cells.

I am certain that if he used this one it could be persuaded to lie to him and free up the funds for a cat sized Jacuzzi.

Mouse Holes

If you look at the Bondwell as a reasonably basic portable business system it stacks up rather well. It's rugged, well designed and thought out and capable of handling the usual applications. It's easy to use and the software which comes with it, in many respects, ranks among the best one can buy. It's a bit heavy as portables go, but, then, most portables are considerably heavier than the briefcases they're intended to replace. If you're a cat this won't matter... I've come across pocket calculators I couldn't move.

This one isn't an IBM compatible at all. It runs CP/M Plus.

The documentation for the Bondwell itself is a bit thin. It assumes a reasonable knowledge of computers before one starts... it tells you what the commands do, but not why you would want to do them. I imagine that even humans would be able to figure this out after a while, but I would have expected a bit more introductory stuff in there. We can't all be cats.

The documentation for the special functions of the system, such as the graphics and the aforementioned squawk synthesizer, is all but non-existent. This is unfortunate, as one would have to write custom code to drive these things if one wanted to make them do something.

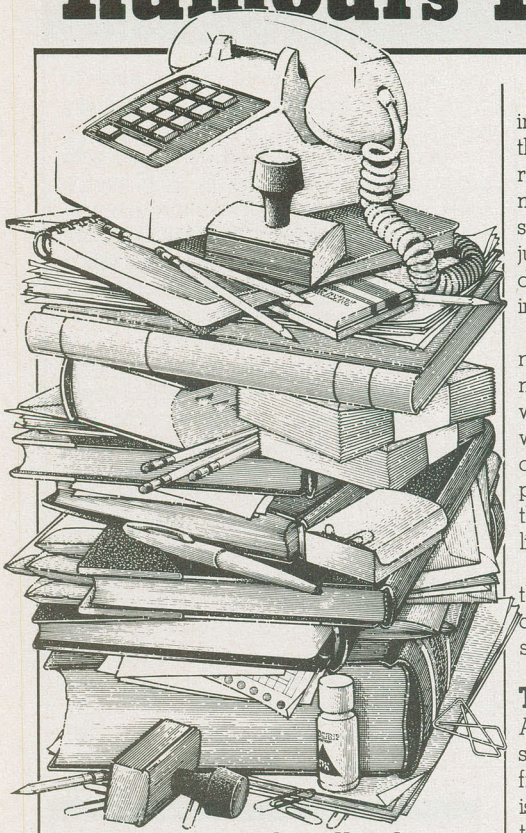
In fact, while the Bondwell comes with programming niceties like its BIOS source code, it's actually a bit of vacuum as a programming environment. The lack of a complete MAC package, and no documentation regarding the use of RMAC, renders it largely assemblerless. Programmers can expect to have to start from scratch.

The MicroPro documentation is superb.

The Bondwell is a reasonably nicely done system, and one which any cat... or human... would find a worthwhile investment. Its books could be a lot better but, then, this is true of most systems. It handles the common applications of a computer admirably, without glitches or peculiarities. Its other attributes... are easily forgotten about.

I wouldn't have minded a talking computer that worked. I could have used it to negotiate for better quarters or a larger TV. I don't dare use this one, though... the humans throw things at it whenever it utters a sound. It's a tough life. **CN!**

Rumours From My Bookshelf



Programming handbooks are among the most difficult volumes to choose. There are plenty of them around... and quite a number of turkeys. Here's a look at some of the better choices from the latest harvest.

by Steve Rimmer

We get fairly inundated with books here... the computer book publishing industry is growing every bit as fast as the technology it supports. Computer books are available for virtually every area of interest, no matter how specialized it may be.

The largest portion of these books fall into the category of amorphous user guides. They tell you how to boot the system, how to back up the disks and so forth. Because even compatible systems have minor variations among models, the same book may get re-written for dozens of machines. As such, we have the IBM User's Guide, the Columbia User's Guide, The Compaq User's Guide, The Corona User's Guide and so on.

New books are being printed almost daily, limited only bythe speed of their authors' search and replace functions.

A bit less prolific are the publishers doing technically oriented books. For one thing, these take a bit more depth and research to get together. They are also a bit more specialized in their audiences, and, as such, do not pose the opportunity of a really juicy first run sell out to quite the same degree as the common sense guides to turning one's machine on.

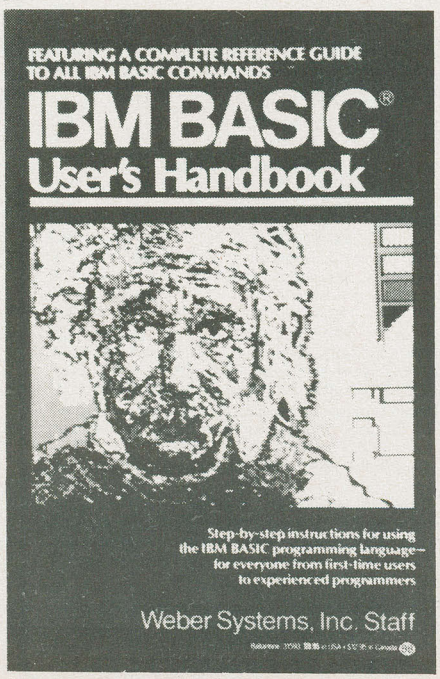
The tsunami of paper has not exactly ignored these works, however, and there are more to choose from than most beings would ever get a chance to check out. As we get 'em all free, I usually have the chance to siphon off the good ones for my private stash. There are perks in a job like this. For one thing, you acquire a splendid library.

This article will feature a browse through my bookshelf, brushing away the dust and the skeletons of long extinct species of crickets.

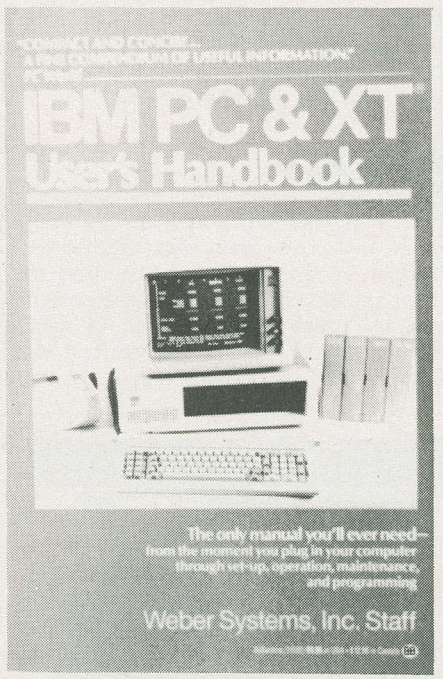
Tales of Fortune

At the moment, about half of my current shelf... the one that holds the books I refer to frequently... is stuffed full of IBM books. This is probably understandable... there is a lot to document in the PC.

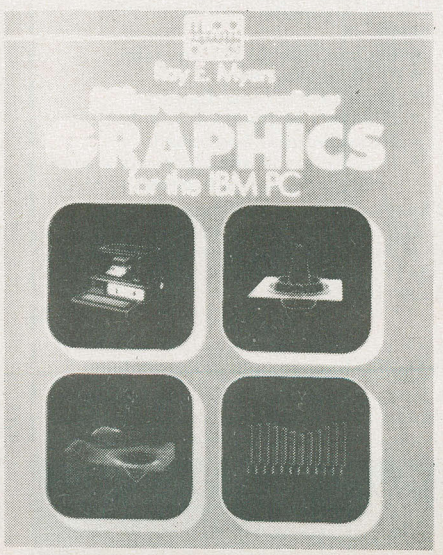
The manual which accompanies Microsoft's GWBASIC is a typical software manual... it's all ready to pop in the oven and serve with cranberry sauce next Christmas. While all the information is in there, it's organized in a singularly unreadable style. There are, fortunately, improvements on this.



The best BASIC book I've come across is, fairly predictably, **IBM BASIC User's Handbook**, published by Balantine Books. It's a chubby little sloth, featuring both a section listing BASIC's keywords and their corresponding explanations, and lots of example programs for unusually weird aspects of the language, like disk files and communications. In fact, it gets into some pretty sophisticated secrets of the package.



The IBM BASIC User's Handbook, despite its notably dull title, is a splendidly useful book. A shorter version of it is found in the **IBM PC & XT User's Handbook**, by the same trolls. This covers not only BASIC



but DOS as well, including the weirdities of revision two. It's equally well recommended.

Finally, **Microcomputer Graphics for the IBM PC**, published by Addison Wesley, is a specialized book about drawing pictures which is well worth having if you are into things visual. It gets involved in excruciating detail, should you find need of it, and speaks to virtually every aspect of doing graphics from BASIC.

Blue Books

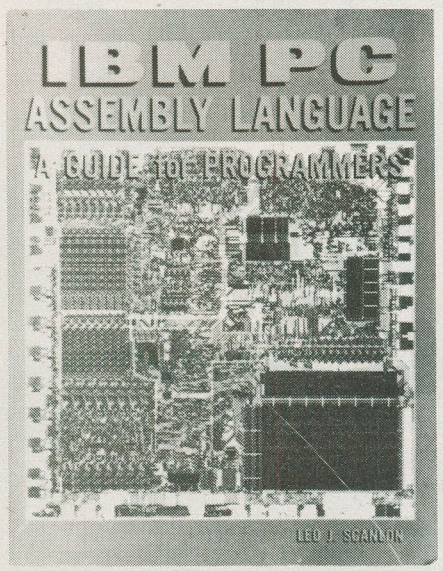
There are fewer books for use with the IBM at the assembly language level... all the one's I've seen so far have been real hand holding beginners' comic books, designed to introduce one gently to the traumas of 8088 programming.

The most painless of these things is **8088 Assembler Language Programming: The IBM PC**, published by Sams. It's pretty good, featuring a number of interesting example programs. Unlike many books, it doesn't get deeply into thirty–two bit math and data structures, but, rather deals with interesting programs that toodle on the peripherals.

The other end of the spectrum is represented nicely by **IBM PC Assembly Language**, published by Robert J. Brady Company. It's dense as titanium on Neptune, and exceedingly boring. However, it is an invaluable reference for anyone programming at the system level, with both a complete list of all the pertinent system calls and their parameters and lots of sample code.

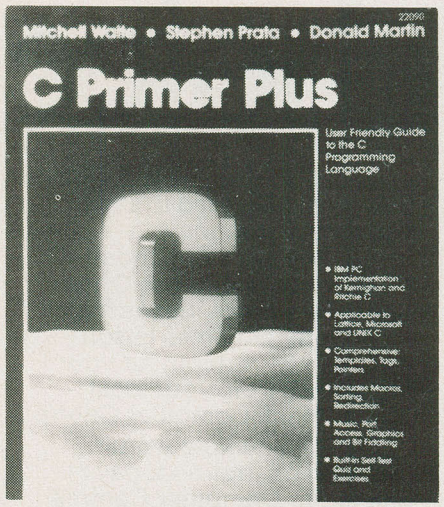
The most involved of the books I've come across is one called **Assembly Language Primer for the IBM PC & XT**, published by Plume. It's considerably thicker than both of the previous two titles put together, and quite well packed with

Rumours From My Bookshelf



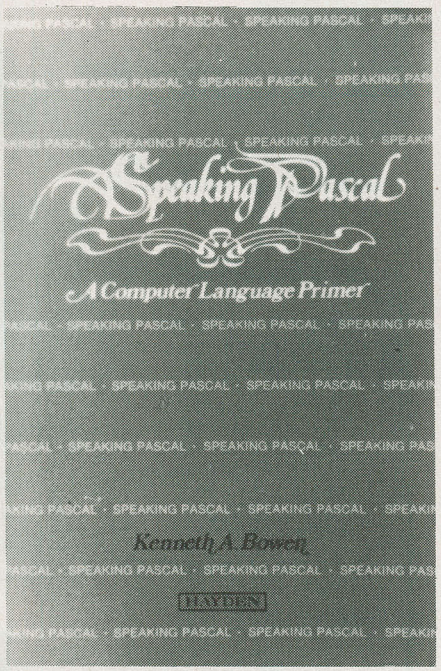
code and information. Weighing in at thirty dollars or so, it's also the most expensive of the lot.

In programming at other levels, there are a number of good language books available. The best one I've come across for C is **C Primer Plus**, by Sams, a fairly meaty tome which takes one through the mysteries of the curly brackets that never quit. It speaks specifically to the more popular PC implementations of C, like *Lattice*.



Also worth the bucks is **Speaking Pascal**, published by Hayden. In conjunction with a reasonably well documented implementation of Pascal... I've become quite attached to Borland's *TurboPASCAL*... it forms a good basis for learning the language and writing non-trivial code. Unlike most Pascal books, it walks the line nicely between being an arid programming tutorial and an extension of the Southern California funkiness that seems to infuse Pascal manuals.

I should mention **Elementary Pascal**, published by Vintage, in this latter context. A tutorial on Pascal couched as a conversation between Sherlock Holmes and Doctor Watson, I got it for two dollars at Coles. An amusing little work, it's practically useless unless you already know Pascal.

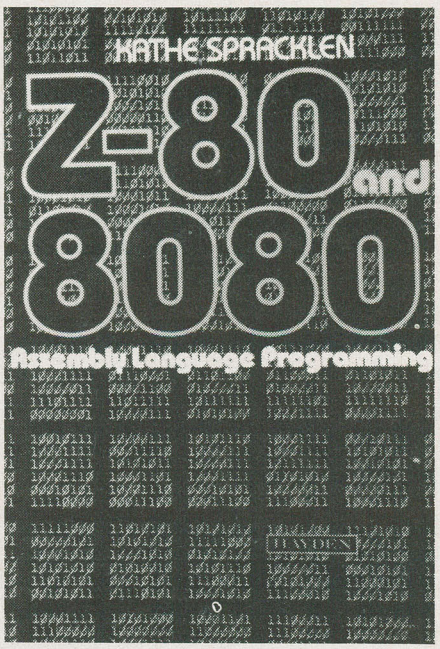


JMP 0000H

Moving ever downwards along the great chain of being, there are rather more low level Z-80 books. A lot of people buy these things to learn how to use the assemblers which come with CP/M... too late do they realize that these are 8080 assemblers, which use different mnemonics. In fact, Z-80 programming is a very specialized area... I rarely have to delve into it except in writing firmware or BIOS code.

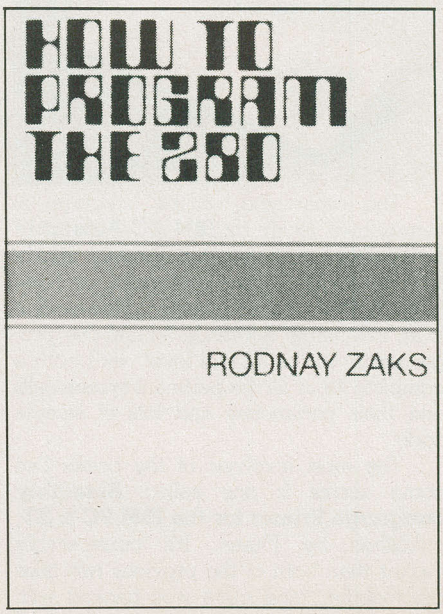
The most useful of these books is **Z-80 and 8080 Assembly Language Programming**, published by Hayden. For one thing, its black and fluorescent green cover makes it easy to spot. However, beyond this obvious utility it offers a quick look at programming these ubiquitous chips, individual explanations of the instructions and a Z-80 to 8080 mnemonic dictionary... an invaluable tool in making sense of other authors' code.

The *Z-80 Users Manual*, published by Prentice-Hall, is a similar book, although not quite so useful. It gets into hardware to some degree... although not enough to be of much practical help.



The most available book on this subject is **How To Program The Z-80**, by Rodnay Zaks. While a reasonable reference work on the subject, it is really poorly written and fraught with critical errors.

Useful Z-80 hardware books are vacuumously scarce, bordering on non-existence. Most of the ones I've come across deal with specific development boards which one must already have gone out and popped for. One of them was a splendid look at a board which hasn't been real for over a year.



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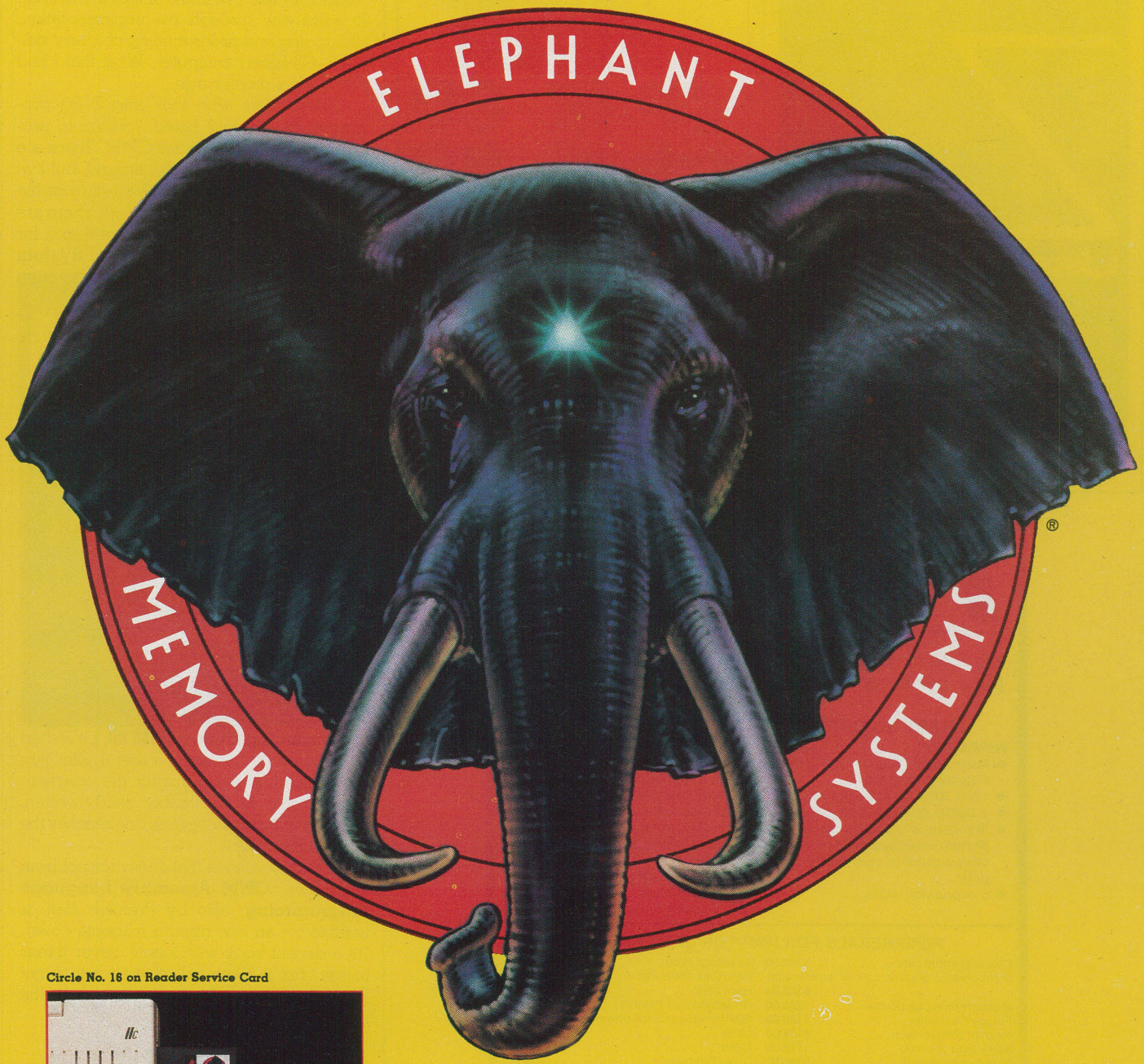

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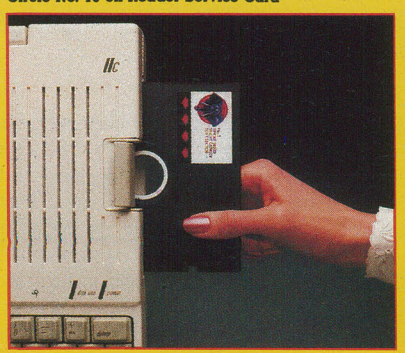

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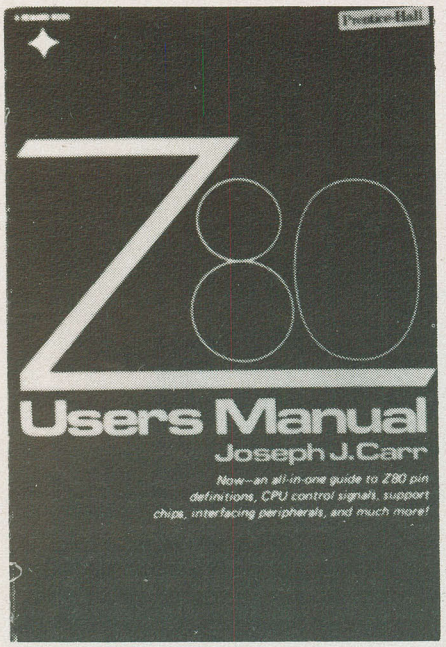
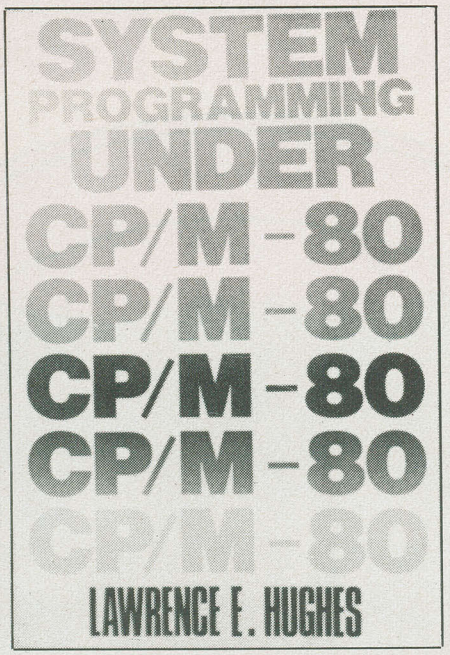
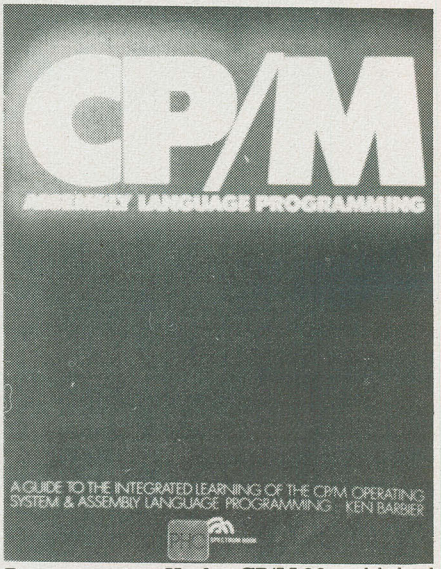
Rumours From My Bookshelf





One very decent exception to this, **Z-80 Microcomputer Design Projects**, published by Sams, is about the best introductory text I've come across in this area. It walks one through the implementation, debugging and programming of a very simple Z-80 based computer. What that I had found it six months ago...

Most users who look into Z-80 programming are, as I noted, looking to program in 8080 code under CP/M. There are 8080 programming guides around, but I've not seen one which really started from the basement and worked its way up. There are two, however, which are decent things for the more advanced programmer. **System**



Programming Under CP/M 80, published by Prentice Hall, features a useful collection of routines and programs for the programmer to study. It's reasonably clearly written, and gets into some depth as one reaches the back of the book.

Another volume that's easy to spot from a distance, **CP/M Assembly Language Programming**, also by Prentice Hall, is notable for an eye ripping magenta cover. It's a decent book with lots of clever things to say, but it takes half of itself just to get through using the utilities and the assembler.

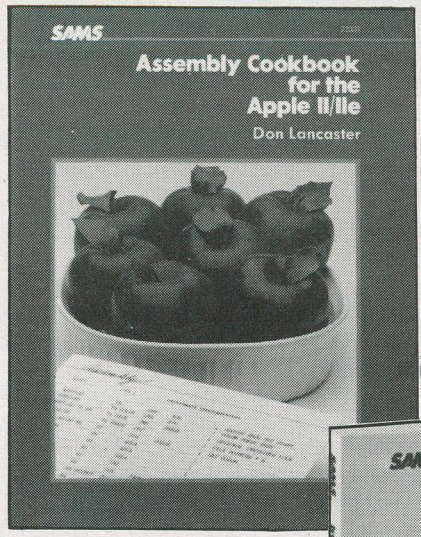
Apple Sauce

My favourite system for just general meddling with is still, unquestionably, the Apple II+. Nothing could match the inestimable funkiness of the thing, made more so by the efforts of the designers of its peripheral cards and, more recently, by those of the Taiwanese dwarfs that made its dastardly clones.

The best Apple books I've come across

Exciting New Releases from SAMS for Apple Users..

NEW BOOK TITLES



Assembly Cookbook for the AppleII/IIe

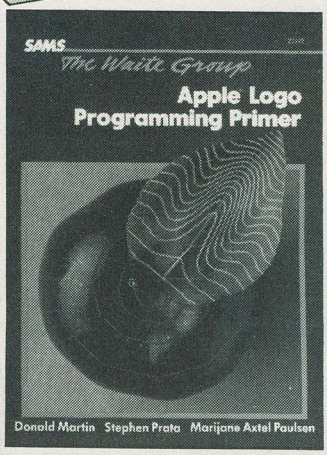
This useful Assembler guide by Don Lancaster is a down to earth way to get into Assembler programming. Topics covered include: what an assembler is, what assemblers are available today, and what tools are necessary for successful Assembler proramming. This book is ideal for those who wish to build their machine language programming skills so as to become an efficient machine language programmer.

No. 22331 **Sugg.$31.50**

Introducing the Apple IIc

Indispensable for helping Apple II apprentices and masters become thoroughly acquainted with compact version of their favorite machine. Describes all new IIc features, discusses compability and differences with the IIe, and covers IIc setup, expansion, graphics, and communications. Guides you in using ProDOS, DOS 3.3, LOGO, Pascal, and Applesoft. Six appendices explain the 65C02 processor, entry points, hardware maps, and much more.
Philip Lieberman

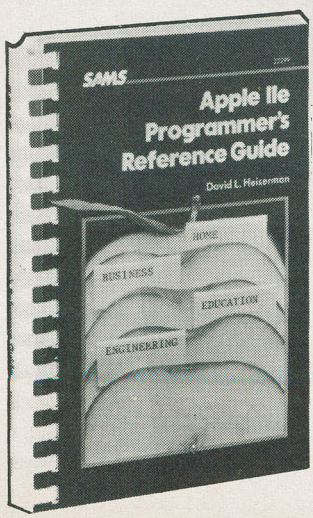
No. 22393 **$18.50**



Apple Logo Programming Primer

The emphasis is on "structured" programming in this Logo primer from Sams. Turtle graphics are used to introduce key programming skills with visual feedback. The "top-down" programming approach is stressed and areas such as recursion and utilities are also covered in depth.

No. 22342 **$27.95**



Apple IIe Programmer's Reference Guide

An outstanding reference guide specifically for the IIe that encourages you to explore new programming ideas and take advantage of some powerful programming procedures by making any needed facts, applications, and other technical information readily available at your fingertips. Also contains many short application and demonstration programs in BASIC and assembly language.
David L. Heiserman

No. 22299 **$27.95**

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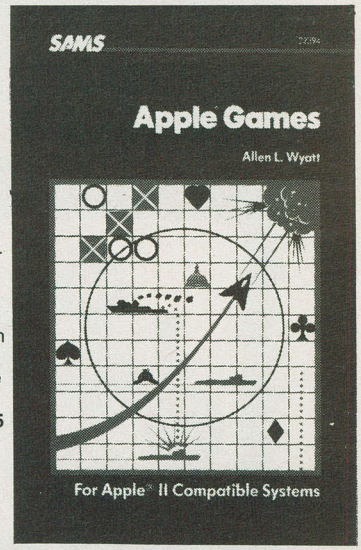
NEW SOFTWARE RELEASES

Apple Games by Allen L. Wyatt

This collection of programs is not intended to amuse as it's title might suggest, rather the author believes that the games included in this package be used for program Development. Allen Wyatt invites the user to "go in and poke around", changing program lines to suit the individuals liking. By doing so the person will learn from the improvements or impairments he or she is making. For the Apple IIc, II, and compatible systems.

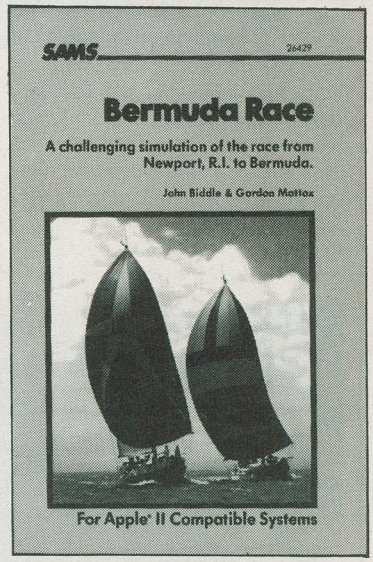
No. 26226 **$35.95**



Bermuda Race by Biddle and Mattox

Harr, are ye yurnin' for the salty spray on yer face Billy? This computer simulation of a race from Newport Rhode Island to Bermuda might just be your ticket to the briney sea. Developed by sailing people using authentic nautical information, this program lets you: plot your course, control your sails, and centreboard, and steering as well as several other aspects of boat performance. This package will run on the Apple II and compatible systems, as well as the Apple IIc.

No. 26236 **$28.95**



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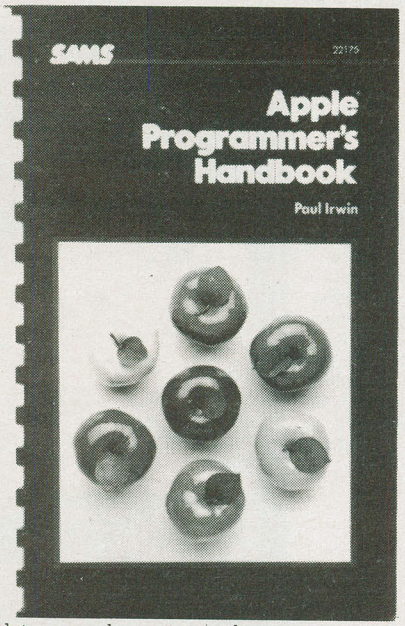
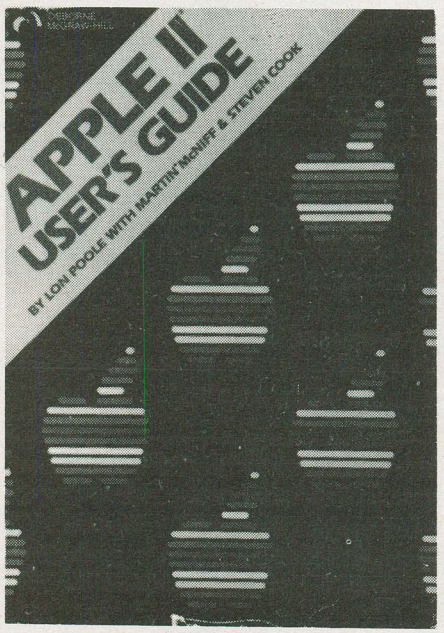
Rumours From My Bookshelf

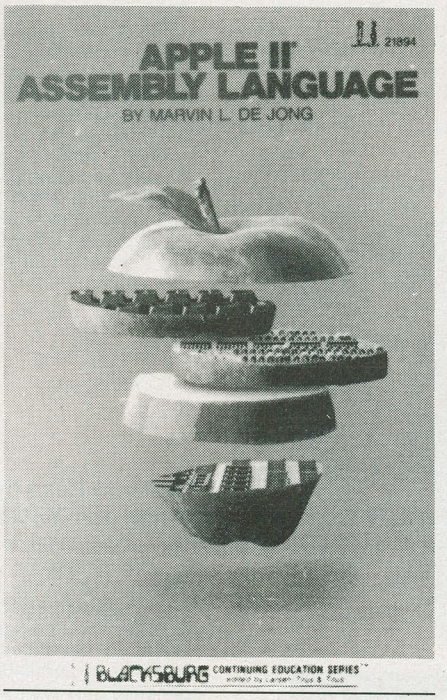


to date are also among the most recent. Published by Sams, the **Apple Programmer's Handbook** is a thick spiral bound wonder which fairly seethes with information. It has a 6502 programming guide, a guide to useful locations and routines for the Apple, hardware hacks and peripheral things and, of course, acres of code. It's easily the finest thing since the Videx card.

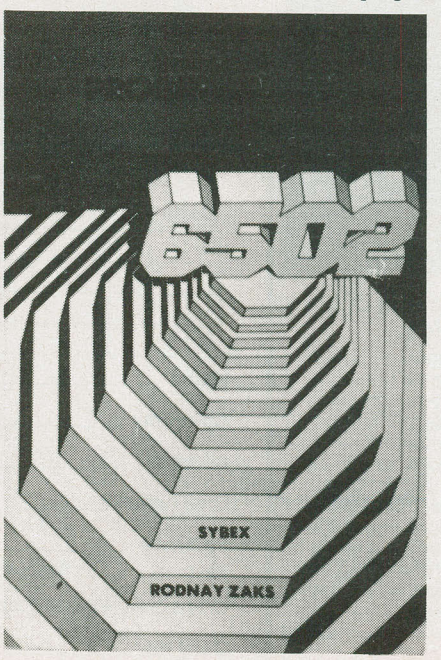


Of equal use to BASIC programmers is the **Apple II User's Guide**, by McGraw Hill. It largely replaces Apple's own documentation, which they kind of got tight with when the clones showed up. Actually, it's considerably more complete than the real Apple manuals, and almost essential for anyone writing programs on a fruit.

This book is also available in a clone version from Taiwan. You should avoid this... it's gross, and likes to fall apart after a few months of use.



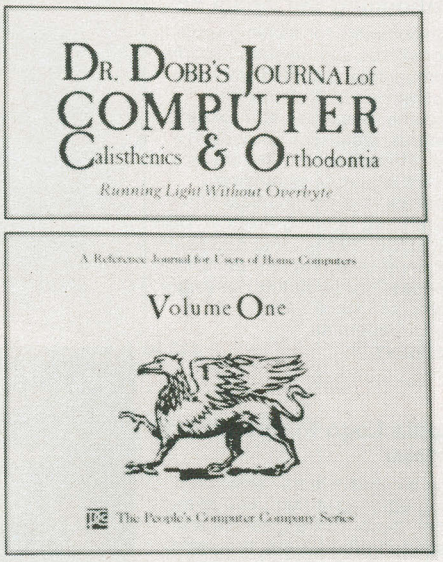
If you enjoy hacking at the low level on an Apple you'll want **Apple II Assembly Language**, published by Sams. It is about the best 6502 assembly language tutorial I've come across. While not so sweeping as the Programmer's Handbook, it's a good place to start.



Finally, **Programming the 6502** by Rodnay Zaks is a decent reference, but, like the Z-80 book mentioned above, has a number of serious errors. Beware especially the deadly JSR instruction... it's 20, not 2D.

Stop the Presses

The last book... or rather, collection... I should mention is the six volume set of bound issues of **Doctor Dobbs Journal**, published by Hayden. This is an essential acquisition if you can relate to all that is human about computers. It is at once a history of the state of the art, an invaluable reference work and a hell of a good read.



Programming books come and go with amazing speed... the headlong rush of technology leaves this stuff behind quite quickly. Keeping up with the new hardware and software is bad enough... reading the books is almost a task in itself.

It is interesting, however, how a few really good books can suffice for an entire area of computer use for an amazingly long time. One tends to supplement them with other sources... magazines, for example. My current library remains fairly small... although the closet where the unworthies go is a thing of terror.

Unfortunately, it's hard to determine whether a book is worth having when you come upon it in the store. You have to have a good read of it... long before which someone will have asked you to buy it or put it back.

One can get pretty broke at twenty-five bucks a shot looking for the perfect book. **CN!**

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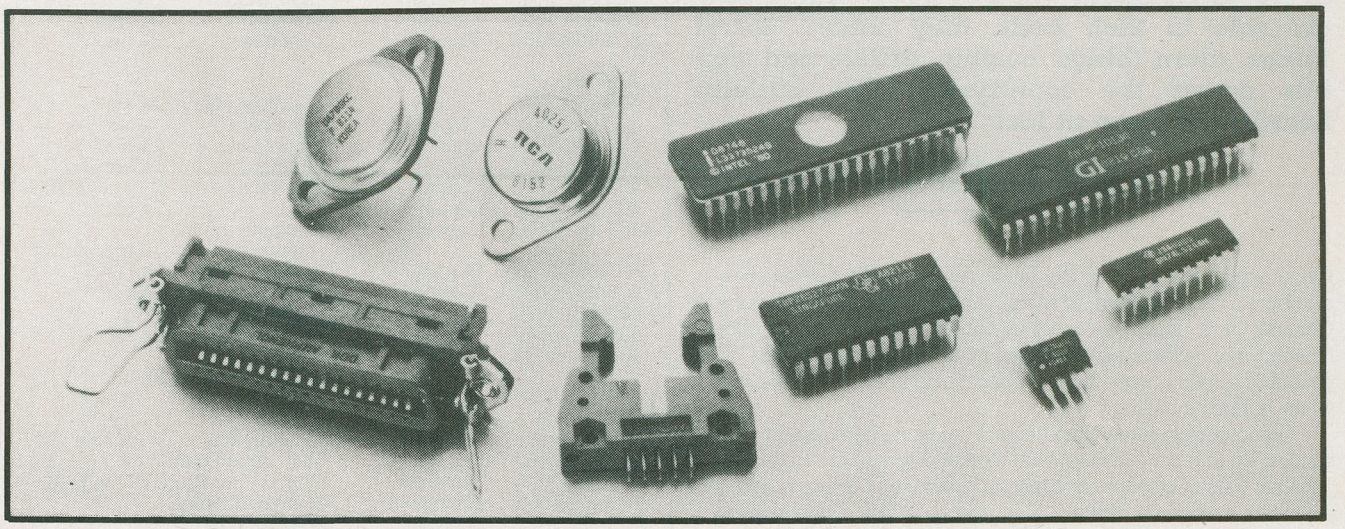

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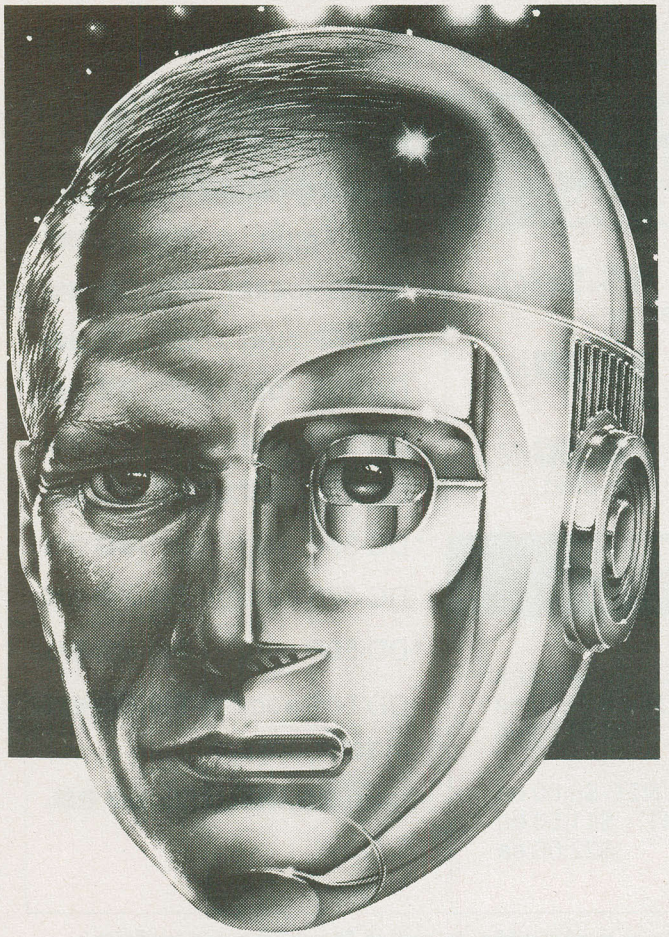
The Invasion of All the BBS Numbers in the World



In the dark of night when everyone thinks they are safe in their beds, they came... secret things, alien things, oozing carriers and stop bits across the countryside. The bulletin boards had come at last.

by Brian Greiner

Once again, we present the latest list of all the bulletin board numbers in the known universe except for the ones outside Canada. It is complete as of October, and finishing it almost finished me. Bulletin boards seem to be breeding like flies. This probably explains what they've been doing in the dark cold hours when nobody's calling.

Some people have asked how I get all these numbers. Well, first I start with my existing list. I proceed to call the boards and get their lists of phone numbers, and start calling those, and get their lists, and so on. If the phone rings but there is no answer, I wait a week and try it again. If there is still no answer, I cross it off my list.

If the line is busy after several tries... at least three... I assume there is something there, and assume it to be a board even if I don't log on. If I do manage to log onto the board, I assume that it'll still be there by the time you get this list... that's not always the case, as boards pop up and subsequently snuff it with amazing frequency.

There's a grand total of a hundred and seventy-four boards in this list... I managed to log onto a hundred and thirty-five, or about three quarters of them. The phone numbers are listed, within the province and city, in numerical order.

I've deliberately omitted a few systems from the list because they seemed to be somewhat private, in house deals that didn't really want to become public. I've also left off the overtly pirate boards. Not only are they generally bad karma, but their operators are usually so flaky as to almost assure that none of the ones that were active when I compiled this list will still be on line when it rolls off the presses.

British Columbia

604-764-7047	Kelowna	Kelowna BBS	
604-562-9519	Prince George	Prince George RCP/M	5 PM to 8 AM
604-263-8864	Vancouver	HOST	8:30 AM to 11 PM
604-272-2549	Vancouver	Startraders	24 hrs.
604-325-3811	Vancouver	A.K.A.T.	24 hrs.
604-434-0001	Vancouver	H&S	24 hrs.
604-438-2468	Vancouver	SATYRICON CBBS	24 hrs.
604-463-7905	Vancouver	Analog BBS	24 hrs.
604-464-5261	Vancouver	Canada West	24 hrs.
604-464-7693	Vancouver	POCO BBS	24 hrs.
604-520-1470	Vancouver	FAST80-2	24 hrs.
604-585-0680	Vancouver	DELTA-80	24 hrs.
604-588-3255	Vancouver	Sprite Computer	9 PM to 9 AM
604-594-7398	Vancouver	FAST80-1	9 PM to 9 AM
604-596-0146	Vancouver	Basic'ly	24 hrs.
604-596-0314	Vancouver	FOG RBBS #2	24 hrs.
604-731-2724	Vancouver	Kits BBS	24 hrs.
604-733-1000	Vancouver	Philosophy BBS	24 hrs.
604-738-2773	Vancouver	CoCo Pacific	24 hrs.
604-926-5070	Vancouver	Apple West	24 hrs.
604-937-0906	Vancouver	Frog Hollow	24 hrs.
604-946-0955	Vancouver	TVG	24 hrs.
604-381-2143	Victoria	IBMPCUG	6 PM to 8 AM
604-384-7607	Victoria	Provider	24 hrs.
604-478-2234	Victoria	DataWest	24 hrs.

Alberta

403-239-3345	Calgary	Dial Your Match	24 hrs.
403-245-2724	Calgary	The Board	
403-246-8064	Calgary	Apple Jacks	24 hrs.
403-255-4121	Calgary	CIBBS	24 hrs.
403-273-1513	Calgary	Ace-Tech	3 M to 10 AM
403-275-1533	Calgary	T.V.C.	24 hrs.
403-287-3638	Calgary	Computer Shop BBS	7 PM to 9 AM
403-288-1601	Calgary	Dimensions #1	24 hrs.
403-289-0501	Calgary	Tel-Atari	24 hrs.
403-420-1679	Edmonton	Workshops	
403-426-0352	Edmonton	Bruce's BBS	24 hrs.
403-454-6093	Edmonton	Edmonton RCP/M	24 hrs.
403-463-5774	Edmonton	South Side RCP/M	24 hrs.
403-464-4172	Edmonton	Antithesystem	9 PM to 4 PM
403-465-3162	Edmonton	That Other Board	
403-466-7656	Edmonton	Commodore BBS	9 PM to 6 AM
403-467-6598	Edmonton	Sherwood Forest	
403-471-2827	Edmonton	Westworld Net-Works	24 hrs.
403-473-2892	Edmonton	Arcadia	
403-474-0147	Edmonton	North Alberta COCO	24 hrs.
403-475-0786	Edmonton	The Outer Rim	
403-481-2596	Edmonton	Crossroad	
403-484-5981	Edmonton	Meadowlark	

		RCP/M	24 hrs.
403-425-9543	Leduc	IBM PC Users' Group	24 hrs.
403-320-6923	Lethbridge	Looking Glass	

Saskatchewan

306-752-5577	Melfort	MGBBS	6 PM to 6 AM
306-694-4126	Moose Jaw	F.O.A.D.	24 hrs.
306-525-3973	Regaina	Edu-Net	24 hrs.
306-584-0748	Regina	Micro City	9 AM to midnight
306-586-5585	Regina	EMIS	24 hrs.
306-665-7085	Regina	Gravestone BBS	24 hrs.
306-789-7883	Regina	Shadowland	
306-949-7766	Regina	Rabid	6 AM to 6 PM
306-242-3134	Saskatoon	SPCUG	
306-242-8055	Saskatoon	Synerscan	
306-374-2391	Saskatoon	Color 80	24 hrs.

Manitoba

204-785-8742	Selkirk	MMS BBS	24 hrs.
204-942-1109	Winnipeg	VE4 Micro BBS	24 hrs.
204-943-9007	Winnipeg	RCP/M	24 hrs.

Ontario

519-853-1063	Acton	PSOC	
705-737-1599	Barrie	Computerland	6 PM to 8 AM
416-632-5653	Burlington		
519-354-6827	Chatham	Chatham BBS	
519-853-1063	Chatham	Pit Stop	24 hrs.
705-445-6032	Collingwood	TBBS	
416-898-2962	Newmarket	Druidboard	24 hrs.
416-576-3213	Oshawa	CIBB	6:30 PM to 8 AM
416-433-0804	Oshawa	Computerland	24 hrs.
613-230-7154	Ottawa	Compucentre	9:30 PM to 8 AM
613-236-1145	Ottawa	Alleycat	
613-523-1614	Ottawa	O.B.E.	
613-526-0062	Ottawa	Micro Tech	
613-592-0240	Ottawa	Edu-Tot	24 hrs.
613-725-2312	Ottawa	Home Computing Club	24 hrs.
613-725-9295	Ottawa	Conference Centre	
613-726-1206	Ottawa	Computer Innovations	10 PM to 10 AM
613-727-0575	Ottawa	Modem World	
613-738-0617	Ottawa	TI-99/4 UG	
613-748-1035	Ottawa	E.T. Wilson	
613-820-4646	Ottawa	TBC-1	
613-820-4669	Ottawa	TBC-2	
807-345-7161	Thunder Bay	Chalkboard	
807-622-2685	Thunder Bay	TBBS/TB	24 hrs.
416-226-9260	Toronto	Willowdale CBBS	24 hrs.
416-231-0538	Toronto	Toronto RCP/M IV	24 hrs.
416-231-1449	Toronto	Toronto RCP/M II	24 hrs.
416-232-0269	Toronto	Toronto RCP/M III	24 hrs
416-232-0442	Toronto	Toronto RCP/M I	24 hrs
416-232-1262	Toronto	Toronto RCP/M V	24 hrs.
416-232-1470	Toronto	Toronto RCP/M VI	24 hrs.
416-241-1659	Toronto	CAUG	6 PM to 9 AM
416-241-4513	Toronto	Night Hawk	24 hrs.
416-265-3227	Toronto	BULL '80	7:30 PM to 8 AM
416-272-0709	Toronto	BBBBS 4	24 hrs.
416-275-0360	Toronto	Mississauga Net II	24 hrs.
416-277-9163	Toronto	Flight Deck	24 hrs.
416-279-9154	Toronto	Polar Bear	24 hrs.
416-281-9452	Toronto	After Hours	6 PM to 8 AM
416-293-7349	Toronto	Dragon's Den	24 hrs.
416-366-2069	Toronto	CFTR BBS	7 PM to 7 AM
416-367-4254	Toronto	Dial-Your-Match	24 hrs.
416-423-5149	Toronto	ETI/CN BULL	5 PM to 7 AM
416-429-6044	Toronto	TPUG-PET	24 hrs.
416-439-0065	Toronto	Games BBS	7 PM to 7 AM
416-445-3083	Toronto	Phobos II	9 PM to 8 AM
416-445-5192	Toronto	PMS LOGIC	24 hrs.
416-445-6696	Toronto	Toronto Net-Works II	24 hrs.
416-453-7885	Toronto	Osiris	7 PM to 12 AM
416-454-3046	Toronto	Info-Tek	24 hrs.
416-461-2110	Toronto	CBBS Toronto	24 hrs.
416-481-8661	Toronto	BBBBS 2	24 hrs.
416-481-9047	Toronto	BBBBS 3	24 hrs.
416-482-2823	Toronto	NightOwl	24 hrs.
416-484-9663	Toronto	EM-X BBS	24 hrs.
416-485-9245	Toronto	Castaways	24 hrs.
416-487-2593	Toronto	Nortec	24 hrs.
416-487-5833	Toronto	BBBBS 1	24 hrs.
416-491-9050	Toronto	Big Blue	24 hrs.
416-492-7960	Toronto	Apex	24 hrs.
416-493-2408	Toronto	TOC	24 hrs.
416-494-8046	Toronto	Vanguard	24 hrs.
416-534-2859	Toronto	VidTek	24 hrs.
416-593-7460	Toronto	Arkon InfoSystem	24 hrs.
416-598-9874	Toronto	Boards Galore	7 PM to 9 AM
416-621-9659	Toronto	Student Exchange	24 hrs.
416-622-2462	Toronto	Atari Infosystem	24 hrs.
416-622-7350	Toronto	Starship Atari	24 hrs.
416-640-3434	Toronto	TBBS	24 hrs.
416-653-2248	Toronto	Colour Dragon 1	24 hrs.
416-665-4568	Toronto	Mount Olympus	8 PM to 9 AM
416-673-0557	Toronto	SGV	24 hrs.
416-675-3214	Toronto	TMUG	24 hrs.
416-683-3733	Toronto	Toronto Net-Works II	24 hrs.
416-698-7994	Toronto	Temple of Doom	24 hrs.
416-731-4797	Toronto	Jail	24 hrs.
416-743-6221	Toronto	CoCo Nut	24 hrs.
416-751-6337	Toronto	PCanada	24 hrs.
416-782-9534	Toronto	TPUG	24 hrs.
416-783-6984	Toronto	IAFYF	
416-787-8630	Toronto	NetCan][	24 hrs.
416-821-3526	Toronto	Hell-Hole	24 hrs.
416-823-1930	Toronto	Almost Heaven	11 PM to 9 AM
416-823-4521	Toronto	Colour Dragon 2	24 hrs.
416-844-2483	Toronto	OTB	24 hrs.
416-884-6198	Toronto	RTC BBS	6 PM to 8 AM
416-921-8179	Toronto	Sherlock	24 hrs.
416-925-2910	Toronto	TRACE BBS	24 hrs.
416-964-6886	Toronto	Buy and Sell	24 hrs.
416-967-5845	Toronto	Alien World	24 hrs.
416-978-6893	Toronto	Medical Network	24 hrs.
416-668-2078	Whitby	Red Baron	24 hrs.

Quebec

418-659-3863	Quebec City	Telesiaq	6 PM to 9 AM
514-337-1112	Montreal	Xerox	5:30 PM to 8 AM
514-366-0795	Montreal	Task Force	
514-392-8411	Montreal	T50	
514-453-6379	Montreal	MAC Telenews	24 hrs.
514-487-2792	Montreal	Microdial	
514-527-3588	Montreal	Babilog 2	
514-598-9093	Montreal	Babilog	24 hrs.
514-622-8586	Montreal	Belle	24 hrs.
514-658-3087	Montreal	Colour-80	11 PM to 6 AM
514-671-6718	Montreal	Sabation II	
514-683-5013	Montreal	Sabation I	24 hrs.
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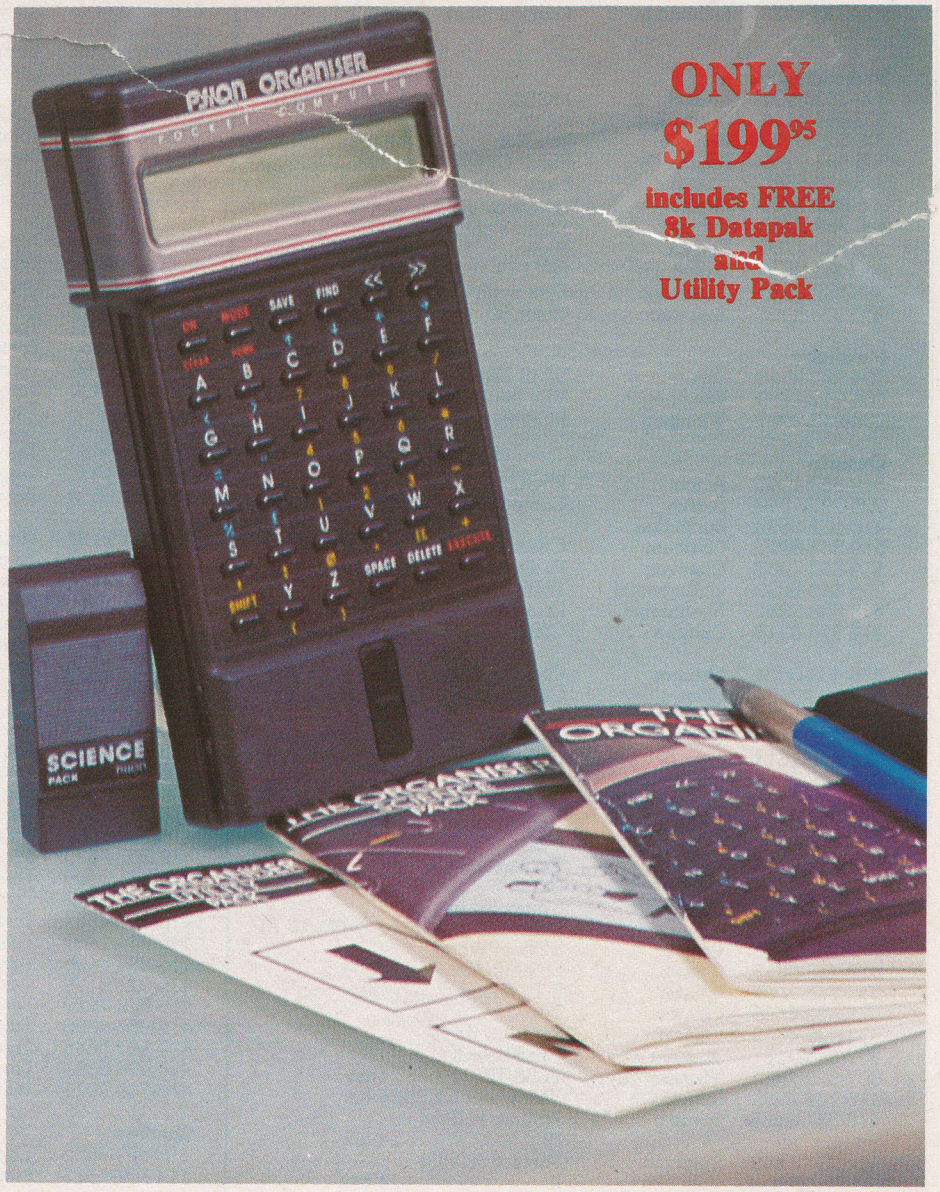

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SCIENCE

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Integration Under a Curve
Lest Square Fit
Solution of Polynomial Equations

UTILITY

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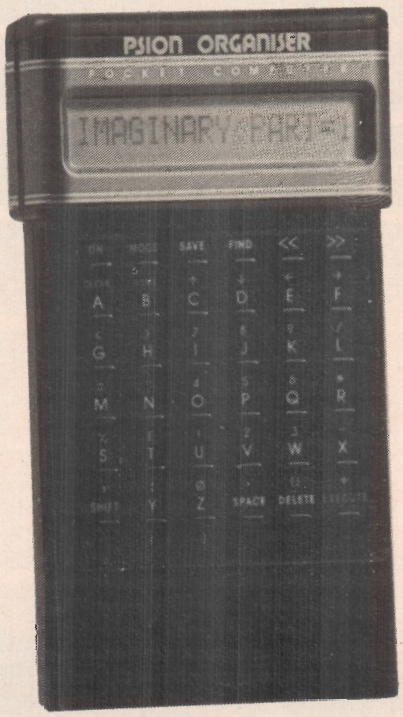

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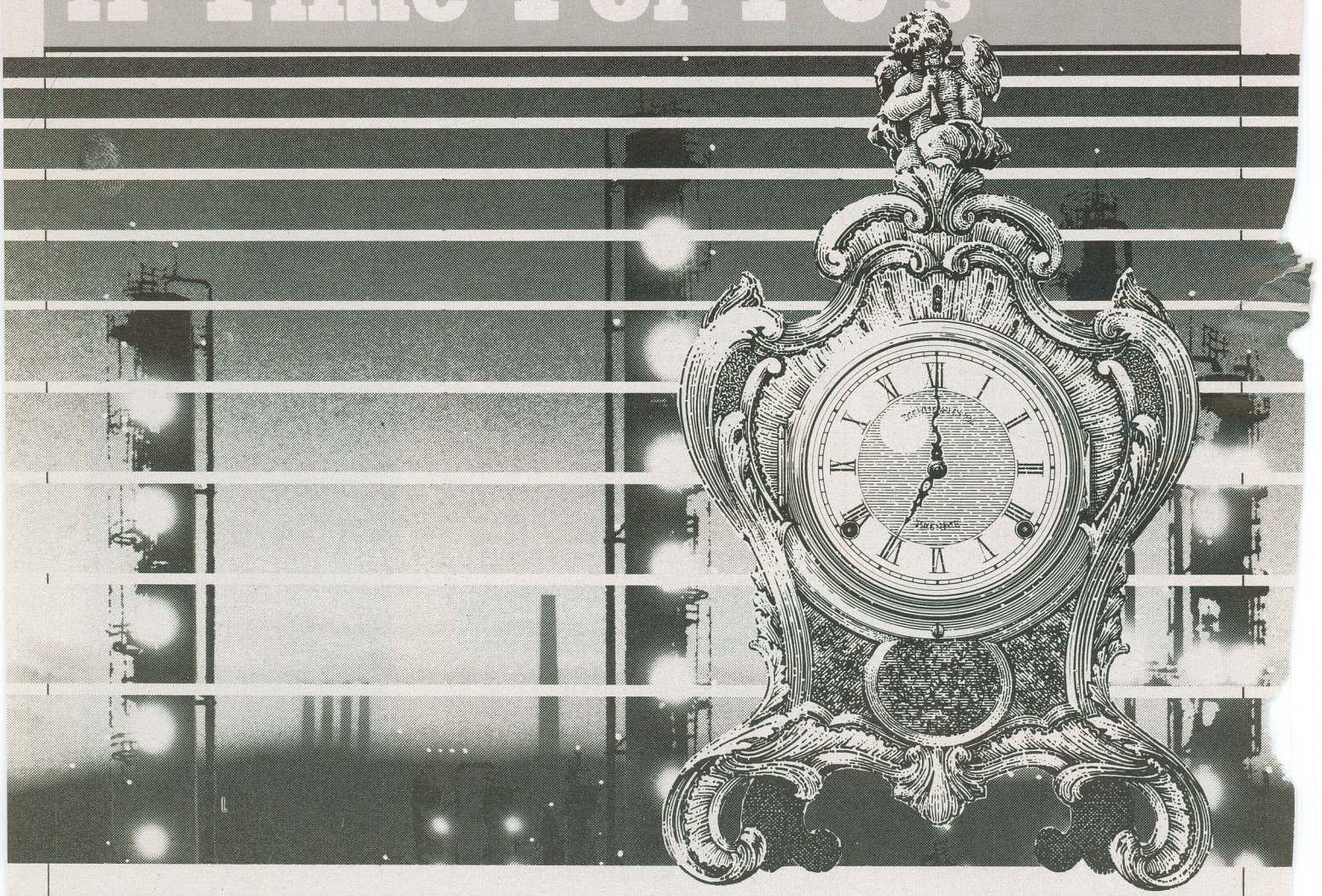
A Time For PC's



The system clock in the IBM PC is a banana of many uses. However, in order to apply it at the machine language level it is first necessary to figure out how to read it effectively. The code awaits.

by Steve Rimmer

The system resources of the IBM are like rich, undulating forests of code when compared to the facilities offered by earlier computers. Not only does it have all of the slick bits, but it supports everything it has porting and peeking out of itself in its operating system. Heads writing software don't have to hack a single byte of driver code... system calls handle everything from serial communications right down to simple screen I/O.

This is, of course, not to say that they handle this stuff in particularly human terms. While it's a lot easier to write code for the hardware peripherals of a PC than it would be for most CP/M based computers, neither task is intrinsically simple. The profundity of interrupt functions available under MS-DOS makes a lot of the gory details ignorable, but one is still left with the hassles of interfacing one's little treasures to MS-DOS.

This ordeal, as is to be expected, is often complicated by a lack of clear understanding... for which one may read *documentation*... concerning exactly how MS-DOS handles a lot of the stuff it does.

The system clock which the PC maintains is probably a reasonable example of something that everyone knows exists... but no one wants to try to get too friendly with. It's a sneaky little troll, made sneakier by the fact that rather than simply presenting you with its information in some sort of quasi-displayable form... as do most clock chips... it actually passes the data around in real sixteen bit binary. Reading the clock, whether for the simple joy of knowing the time or for inclusion in a larger program, can be a bit of a struggle.

Time In a Klein Bottle

The 8088 microprocessor is a complex monster, made more so by its industrial strength support chips. One of these things is called an 8253 timer. While it has a number of programmable modes, it is normally used to produce an *interrupt tick* for the 8088, among other things. In fact, this chip consists of three programmable timer sections, so it handles several things at once.

The interrupt tick, not surprisingly, causes the 8088 to throw an interrupt every so often. This sees it jump to an interrupt service routine, the normal result of one of these things. While this

could handle a number of functions, what it does for a straight up PC is to increment the clock counter. More sophisticated code can be used to translate the assembled number of ticks into a real time count.

Naturally, this is the real time as taken from the time the machine is turned on.

This may seem a bit weird, as the interrupt actually does break out of the program that's running on the machine several times a second to service the clock. Your application stops applying itself each time one of these things comes down. However, the interrupt routine is responsible for preserving the values of all the registers which might get modified in handling the call. As such, when the interrupt returns, it pops the processor back where it was when the service call came through as if nothing had happened... aside from a few steps in the march of time.

This, in fact, is all of academic interest only at the moment. The clock operates transparently to the system and, for our purposes, we can assume that small pink eyed albino dock workers handle the updating, just like they do the international money supply and most commercial television.

The reading of the clock is also handled by an interrupt call. This won't come as a surprise to you if you've had a brush with PC assembly language programming before, as absolutely everything happens through interrupts. However, unlike as in the case of the clock update, the clock reading interrupt is always called from software. It is, in fact, interrupt 21H when the AH register is set to 2CH.

When you cause this interrupt to happen the PC will disappear into its back room and emerge with the current time safely bundled up in the CX and DX registers. This is where the whole rollicking flea circus really gets under way.

In the case of most hardware microprocessor clock chips, the time is returned as ASCII digits, or something which easily translates into displayable characters. In the worst case you have to split a few bytes into their component nybbles to extract the time. Reading clocks like this is piteously simple.

The PC doesn't do it this way, as we've noted. The bytes which return from the time read interrupt are binary values which, while great for using in calculations and storing in buffers and the like, really present themselves as major pains if you just want to see what they are... unless you want to see them displayed in hex.

When the PC returns from its clock reading foray, it has the hours... based on a twenty–four hour clock... in the CH register. The minutes languish in CL. The seconds are in DH and the hundredths of seconds, for whatever good they may be, are in DL. We're going to ignore the latter value in this exercise, as quite a number of hundredths of seconds will elapse between the time the accompanying program is run and the time it actually does its stuff.

I always used to like it when Mister Spock told the captain that the ship would blow up in twenty–one point four seconds. You'd wonder if that was calculated from the time he first opened his mouth or from when he actually said "point four".

Now, there are a number of fairly simple ways to read the time on the PC. Typing TIME works well. However, this command isn't really suitable for inclusion in a BAT file wherein you just want the thing to spew out the time, as it insists on giving the operator the opportunity to change the time. It'll wait for a response even if you like the time just the way it is.

TIME also insists on giving you the time in the twenty–four hour military format instead of the funky human style with *am* or *pm* tagging along behind.

In addition to this, you can't access the code which drives TIME from larger programs... at least, it'd be tricky. The program which accompanies this article is sent from the gods of silicon for lacing into a larger application.

```
; ..................................
;
;       Clox IBM PC Clock Code
;       Copyright 1984 (c) Steve Rimmer
;       May cause disturbances in interspacial
;       dimensional quark factories
; ..................................
;
STACK   SEGMENT PARA STACK 'STACK'
        DB      256     DUP(0)
STACK   ENDS

DATA    SEGMENT PARA PUBLIC 'DATA'
TIMEIS  DB      'Argh, the time be: $'
AMPM    DB      ' am$'
DECBUF  DB      '     $'          ;DECIMAL CONVERSION BUFFER
DATA    ENDS

CODE    SEGMENT PARA PUBLIC 'CODE'
START   PROC    FAR

        ASSUME  CS:CODE
        PUSH    DS
        MOV     AX,0
        PUSH    AX
        MOV     AX,DATA
        MOV     ES,AX
        ASSUME  ES:DATA
        MOV     DS,AX
        ASSUME  DS:DATA         ;USUAL POMP

        MOV     DX,OFFSET TIMEIS
        MOV     AH,9
        INT     21H             ;SAY "THE TIME IS"

        MOV     AH,2CH
        INT     21H             ;GET THE TIME

        PUSH    DX              ;SAVE SECONDS
        PUSH    CX              ;SAVE MINUTES
        MOV     CL,CH           ;SECONDS ARE IN HIGH BYTE
        MOV     CH,0            ;MOVE DOWN & NULL HIGH BYTE
        MOV     AX,CX           ;SET UP FOR DECOUT

        MOV     BX,OFFSET AMPM+1
        MOV     CL,'a'
        MOV     [BX],CL         ;SET UP FOR AM
        CMP     AX,13
        JL      MORN            ;IS IT AM?
        SUB     AX,12           ;IF NOT, CIVIL TIME ADJUST
        MOV     BX,OFFSET AMPM+1
        MOV     CL,'p'
        MOV     [BX],CL         ;AND SET UP FOR PM

MORN:   CALL    DECOUT          ;SHOW HOURS
        CALL    COLON           ;SHOW COLON
        POP     CX              ;GET MINUTES BACK
        MOV     CH,0            ;NULL OUT HIGH BYTE
        MOV     AX,CX           ;SET UP FOR DECOUT

        CALL    PADZERO         ;SEE IF WE NEED A ZERO, ZORRO
        CALL    DECOUT          ;SHOW MINUTES
        CALL    COLON           ;SHOW COLON

        POP     DX              ;GET SECONDS BACK
        MOV     DL,DH           ;SWAP H INTO L
        MOV     DH,0            ;NULL OUT HIGH BYTE
        MOV     AX,DX           ;SET UP FOR DECOUT

        CALL    PADZERO         ;SHALL THERE BE A ZERO?
        CALL    DECOUT          ;SHOW SECONDS
        MOV     DX,OFFSET AMPM
        MOV     AH,9
```

```
        INT     21H             ;SAY AM OR PM

        RET                     ;ALL DONE

;       +++ SUBMARINES

COLON   PROC    NEAR
;SHOW THE COLON
        MOV     DL,':'          ;PRINT...
        MOV     AH,2
        INT     21H             ;SHOW COLON
        RET
COLON   ENDP

PADZERO PROC    NEAR
;INSTALL PADDING ZERO IF NEEDED
        PUSH    AX              ;SAVE THE VALUE
        CMP     AX,9            ;MORE THAN ONE DIGIT?
        JG      NOZERO          ;IF SO, WE DONE BYE BYE
        MOV     DL,'0'          ;OTHERWISE, PRINT
        MOV     AH,2            ;A ZERO
        INT     21H
NOZERO: POP     AX              ;RESTORE THE VALUE
        RET
PADZERO ENDP

DECOUT  PROC    NEAR
;CALL DECIT AND SHOW NUMBER WITHOUT SPACES
        PUSH    AX
        MOV     BX,OFFSET DECBUF
        CALL    DECIT
PRNDEC: MOV     AH,9
        MOV     DX,BX
        INT     21H
        POP     AX
        RET
DECOUT  ENDP
DECIT   PROC    NEAR
;CONVERT THE NUMBER IN AX INTO A DECIMAL REPRESENTATION
;STORING IT IN THE BUFFER POINTED TO BY BX
        PUSH    DX
        PUSH    SI
        PUSH    AX              ;SAVE AFFECTED REGISTERS
        MOV     CX,5            ;BUFFER IS SIX BYTES

SPACES: MOV     BYTE PTR [BX],' '
        INC     BX
        LOOP    SPACES          ;FILL WITH SPACES
        MOV     SI,10
        OR      AX,AX
        JNS     DIVID
        NEG     AX

DIVID:  SUB     DX,DX
        DIV     SI
        ADD     DX,'0'          ;ADD ASCII OFFSET
        DEC     BX              ;POINT TO NEXT BUFFER BYTES
        MOV     [BX],DL
        INC     CX
        OR      AX,AX
        JNZ     DIVID           ;LOOP 'TIL NEGATIVE
        POP     AX
        POP     SI
        POP     DX
        RET
DECIT   ENDP

START   ENDP
CODE    ENDS
        END     START
```

Clockworks

The operation of the CLOCK utility should be fairly easy to understand. To begin with, you can start by ignoring the block of code with all the ASSUME pseudo ops in it... this is simply a bit of bowing and scraping that the operating system likes to subject its vassals to. The next bit is a painless lead in, printing a message to the screen to say "Argh, the time be: "... or anything else you feel makes a suitable introduction.

Next, of course, we have to actually get the time. The mechanism of this is largely as we looked at a few moments ago. The code which happens after the return from the second 21H interrupt call is all cosmetic... it presents the clock data in a decent form.

The heart of the display routine is the decimal converter. This is largely the same code as we saw way back when in the April 1984 edition of Computing Now!. However, there are a few refinements to it shown here which make it suitable for this application.

This thing actually works backwards, filling the decimal conversion buffer with the least significant digit first. It will continue to move ahead in the buffer until it encounters its first leading zero. Actually, it loops until it gets a negative result from its division operation, which amounts to the same thing. It then returns.

Because of the way the decimal routine functions, it returns a pointer into the buffer in the BX register which indicates where the first valid byte of data is. As such, it's possible to control the formatting of the time display with relatively little sweat. We just print everything from the byte pointed to by BX up 'til the dollar sign which is permanently installed at the end of the buffer.

Reasonable coolness also dictates that numbers smaller than ten, which would display out as single digits, be padded out with one leading zero so as to keep the clock display from having varying lengths.

The only other trick involved in this is in having it differentiate between morning and afternoon. This comes down by checking out the data in the CL register... after it has been moved to the AX register for eventual decimal conversion... and pondering on whether it's greater than twelve. Hour counts greater than twelve are slashed by twelve and cause the "a" in "am" to be replaced with a "p".

A Switch In Time

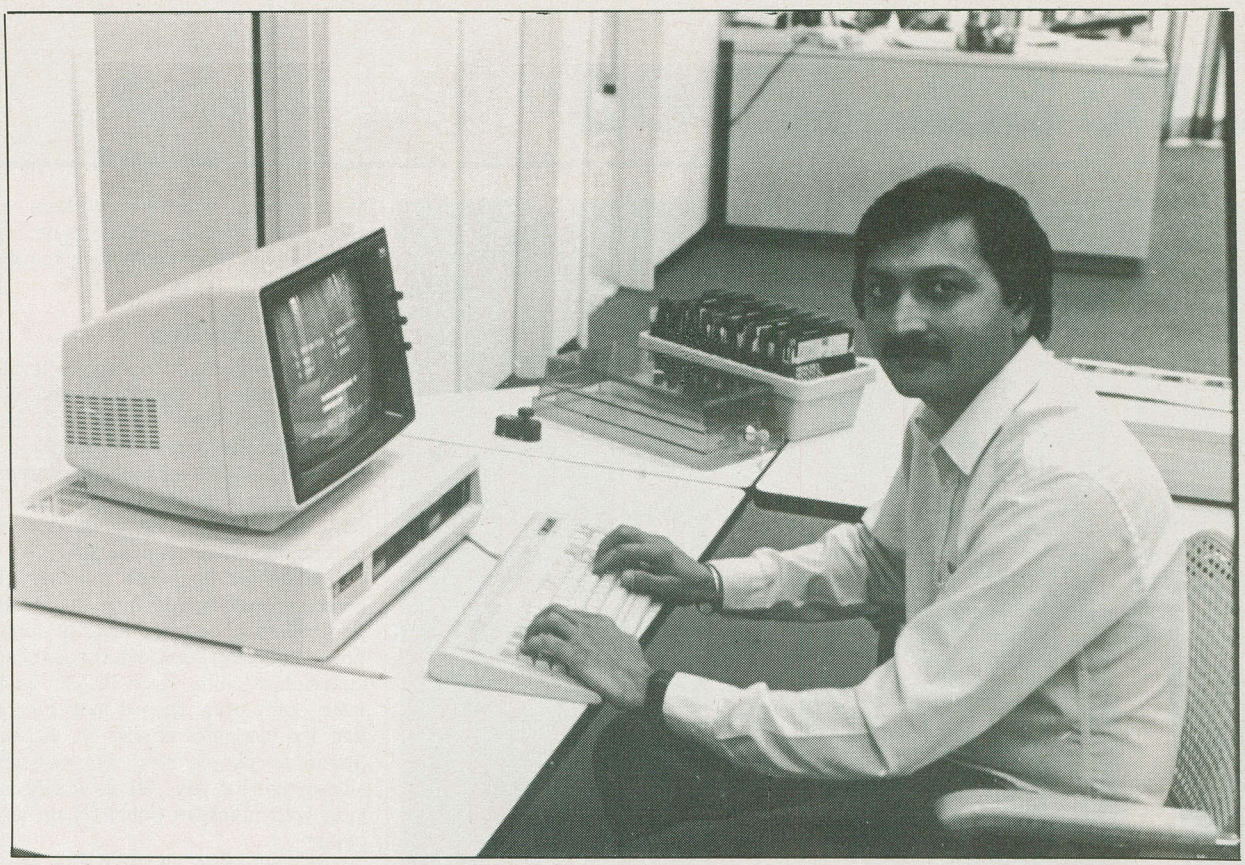
While the PC offers all its facilities to the planet in theory, it's a bit of a cow at times in practice. It takes quite a lot of code, in many cases, to get what it spews forth from its multiplicity of registers to turn up smiling on the tube.

You can modify this program quite a lot. For example, the system clock comes complete with a data function, which is handled by calling interrupt 21H with the AH register loaded with 2AH. The year minus 1980 will creep back in CX, the month in DH and the day in DL. The calendar code in the PC is pretty slick... it compensates for short months and so on.

If you have a real time clock on your machine, one which is backed up with a battery to keep the time and the date even after you power down for the night, you can set the CLOCK program up to tell you then time, rather than asking for it every time you book the computer. All you need is an AUTOEXEC.BAT file with your clock driver's name in it followed by the CLOCK command. This will hook in the real time clock chip and then read it for you, disabling the usual time and date request and dropping you into DOS.

If time weren't a complete lower dimensional illusion perpetuated by the galactic overlords this sort of code might even have applications in the real universe. However, as we all know, time was cancelled in early 1972 and the funds to start it up again do not seem to be forthcoming.

Perhaps someone could arrange to restructure the universe to be interrupt driven. Imagine the advertisements from the company that gets to source the galactic microprocessor... **CN!**



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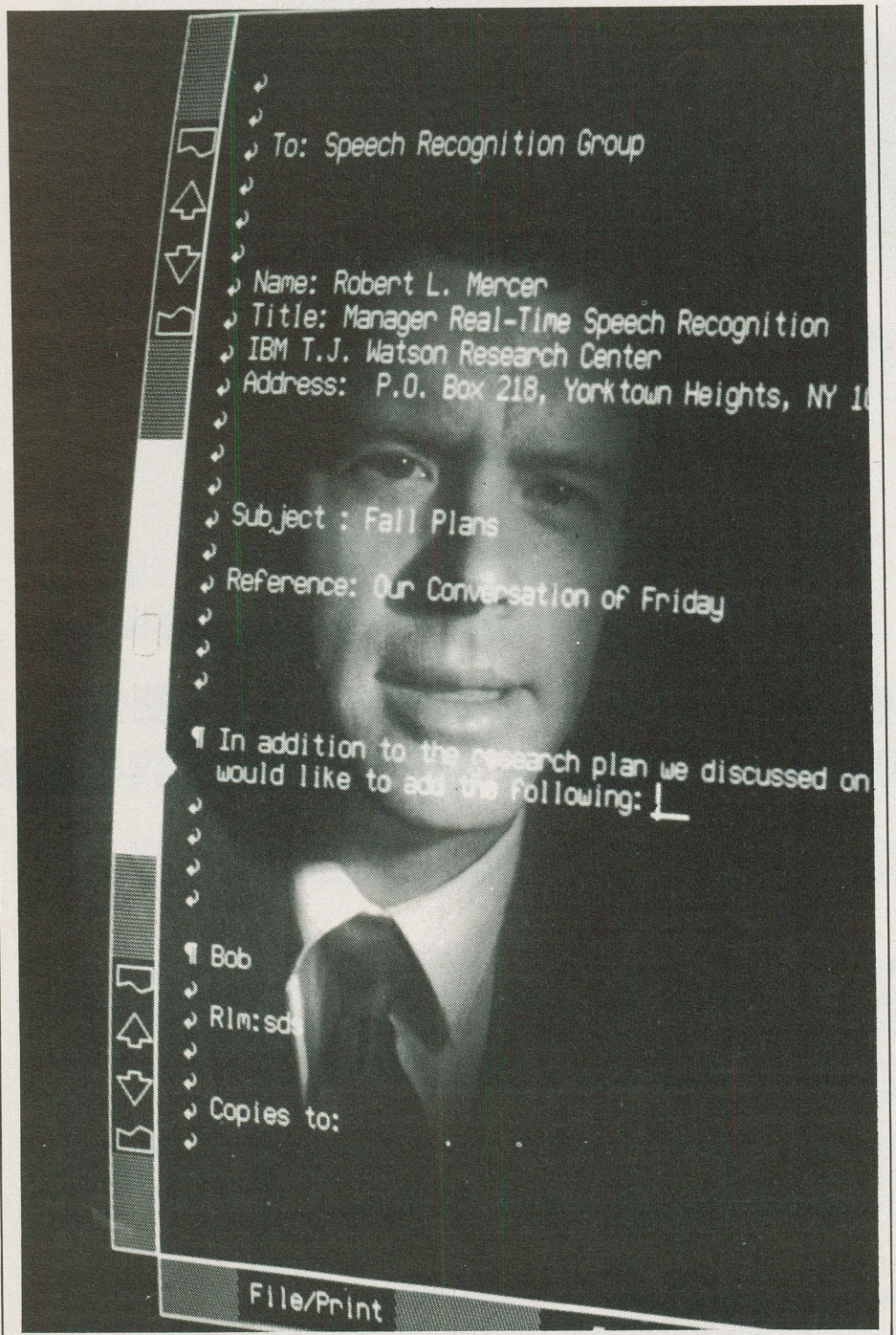


Watching the ol' monitor all day *may* do in your orbs. Here's a look at the current state of the research.

by Bob Whitton

Ever wonder what happens to your eyesight when you sit looking at a computer screen all day long? It's no secret that many all day computer users complain about eye fatigue, headaches, after-image flashes . . . sometimes even blurred vision.

A recent study undertaken by the Canadian Labour Congress and involving twenty-three hundred workers showed those who work at computers or computer terminals are much more likely to report eye problems.

Eye For An Eye

Whether working at computer terminals is really harder on eyesight than any other type of office work has yet to be determined. One of the most widely reported studies involved Swedish air traffic controllers. This study suggested the air controllers' work, done at computer terminals, had a slight detrimental effect on eyesight.

There are concerns, however, that the Swedish studies may not be meaningful, particularly since there was no "control," or group not using computers order similar circumstances, with which the air controllers were compared. Thus it may be the case that the negative effects on vision is no greater for people using computer terminals all day than for, say, people working all day long with numbers pencilled on sheets of paper.

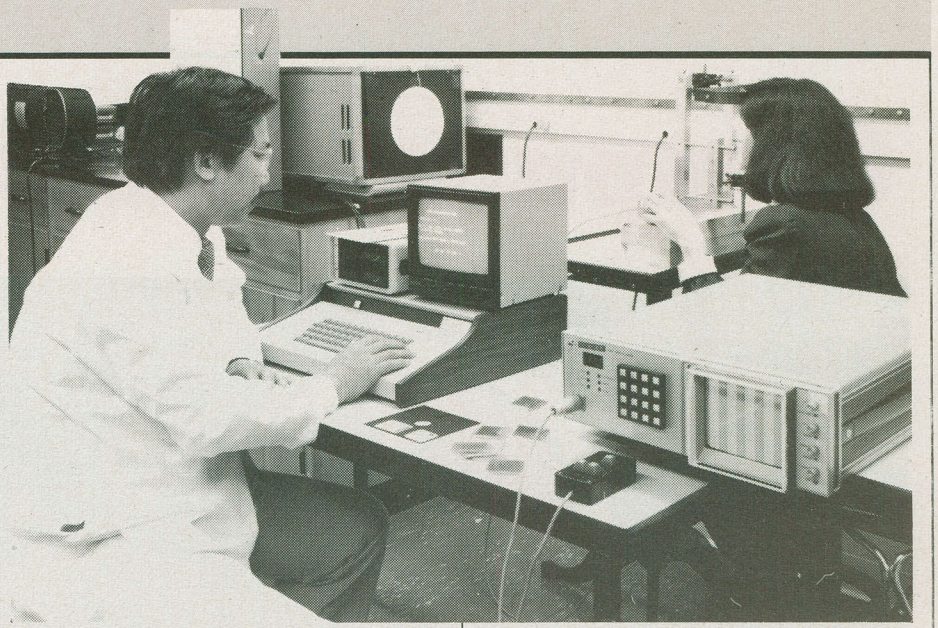
A University of Waterloo optometry professor, Doctor George Woo, has embarked on a research project into this whole subject, the effects on vision of day long work at cathode ray tubes. He is investigating vision changes among two groups of clerical workers on the Waterloo campus, those who work at computers or computer terminals all day long and those who do not.

Doctor Woo's studies are being funded by the Ontario government's Ministry of Labor, which is providing thirty-one thousand dollars grant. He is using the grant to conduct the study, selecting two groups, with approximately fifty subjects in each.

The members of both groups go to the university's optometry clinic at the start and finish of a typical working day. Their vision, including refractive error, is measured very carefully to see if it is as good at the end of the day as it was at the start. Doctor Woo and his co-researchers are using some extremely sophisticated techniques to detect extremely slight changes in vision.

The things they are interested in include changes in the visual acuity . . . the ability to read small print clearly, refraction . . . small corrections for far sightedness or astigmatism that may not be required for every day vision but that become important for VDT operators and accommodation . . . flexibility in focusing from far to near objects and back again.

A battery of eye tests are administered to the subjects . . . including two that are unusual. These are contrast sensitivity measurement and chromoretinoscopy.



Equipment to measure contrast sensitivity has long been on hand in UW's optometry clinic. In fact, Doctor Woo himself has had a hand in the development of it. It is normally not to be found in the clinics of either optometrists or opthalmologists. It is particularly designed for people who can't seem to see well even though they don't do badly when it comes to reading a regular eye chart.

"Some people see reasonably well when there are sharp contrasts such is the case with a regular eye chart, a black letter on a white background," Doctor Woo explains, "but these people may have trouble dealing with gradations that is, they have difficulty picking out objects set against less contrasting backgrounds. In our tests for contrast sensitivity we use a computer to generate patterns of lines that are varied, then measure very small changes in a person's ability to see these patterns."

Chromoretinoscopy involves examining the focusing characteristics of the eye using different colored lights.

One of the things Doctor Woo hopes to learn from this kind of examination concerns the kinds of computer screens that are easiest of the eyes. Is, for example orange lettering better than blue?

"It may be," says Doctor Woo, "that any harmful effects that are found to occur can be eliminated by changing the lettering on the computer screens, by increasing the size of the printing, by increasing the spacing between words or between lines, by changing the lighting, by glare reduction, or by some other adaptation.

Or, it may be helpful if the screens are in multiple colours instead of orange on black, or green on black, or whatever the combination is now.

"Possibly," Doctor Woo conjectures, the complaints we have all heard with respect to computer terminals are sometimes psychologically induced rather than a matter of actual physical harm to our eyes.

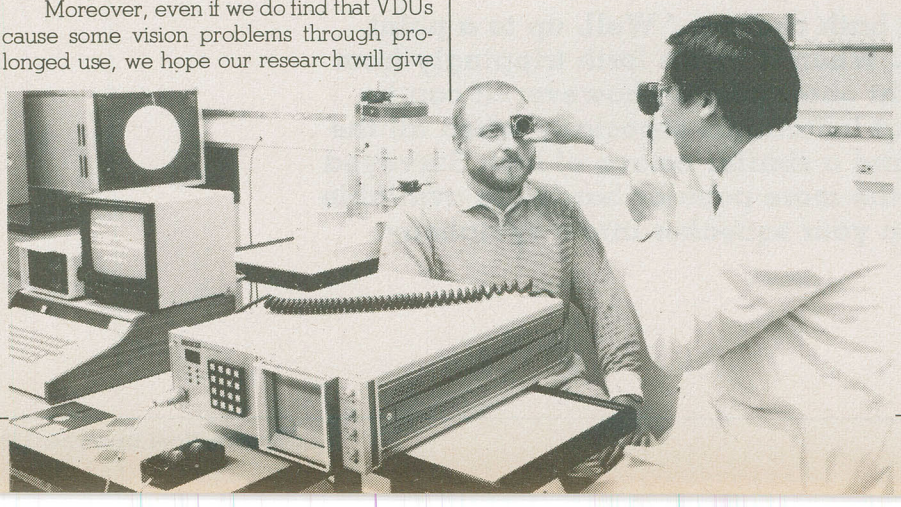
Moreover, even if we do find that VDUs cause some vision problems through prolonged use, we hope our research will give better insight into what can be done to minimize such harm.

We may just find, of course, that working at a computer terminal all day long is no harder on one's eyesight than any other type of office work. It may be impossible for us to detect any difference between the computer user group and the non-user group. All this remains to be seen.

Doctor Woo says two years ago he did a preliminary study involving several University of Waterloo computer terminal operators. This study, done on something of an ad hoc basis, nonetheless indicated a need for a comprehensive study dealing with the vision of VDT workers. It was this preliminary study that prompted him to submit his proposal to the Ministry of Labor for a grant for the current project.

He says that to his knowledge, the current research is the only study of precisely this kind being done anywhere in the world.

"A very important aspect to our current research is our control group of non-computer users," he said. "We did not have this in our earlier, small study. Nor did the researchers in the Swedish study make use of a control group. We feel however that the fact that we have such a group now, a group of non-users with which the user can be compared, will make our research much more meaningful. It should help governments in their efforts to set standards and adquately safeguard the vision of computer users. It should also, of course, be of great interest and benefit to the manufacturers of VDUs."



Video Blues

While the current project will only permit the Waterloo reseachers to draw conclusion as to the short term effects of computer terminals on vision, Doctor Woo is expecting to repeat his examination of the members of the two groups one year from now.

"We hope the Ministry of Labor will renew our grant in the second year," he says. "The follow up will give us some indication as to whether computer usage has long term effects on vision that are not apparent in the short term . . . and if so, the extent of these effects."

The results of the current study will be made public some time in 1985, Doctor Woo anticipates. The results from a follow up study, if it is funded, would also be published.

This research involves a team within Waterloo's school of optometry comprising Doctor Woo, Doctor Graham Strong, Doctor Jacob Sivak, the director of the school and a prominent researcher in the field of chromatic aberration and its impact on vision and Doctor Barb Robinson, an authority on epidemiology and public health. Doctors Sivak and Robinson are serving as consultants. Doctor Sivak holds a patent on the chromoretinoscope being used in this study.

CN!

Computer Music Survey

'Music hath charms...' Well, up to a point, perhaps. When it bursts forth trippingly from an eight ohm speaker, however, it can be somewhat irritating... especially when all the notes sound a similar octave of bad. Surveyed below is the more popular hardware available to turn your squeaker into a symphony.

Compu–Music

Computers: Apple, Commodore, NEC, TRS–80
Description: Self–contained synthesizer with six musical voices, a seven voice drum section and tempo control. Full mixing capabilities into a single audio output, or separate outputs for melody, bass, chords and rhythm.
Software Required: Accompanies Apple and Commodore versions. NEC PC–8801 software costs $75.00, NEC PC–6001 software available separately. Other software available.
Suggested Retail: $495.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

Compu–Synth

Computers: Apple, Commodore, NEC, TRS–80
Description: Monophonic synthesizer for use with Compu–Music. Full featured solo synth, with on–board voltage controlled amplifier permitting programmed control of dynamics from computer.
Software Required: As above.
Suggested Retail: $350.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

Compu–Sync

Computers: Apple, Commodore, NEC, TRS–80
Description: Provides a tempo controller, frequency shift keying tape sync, Roland 5 pin DIN sync and voltage controlled clock output. Allows synchronization of external instruments with Compu–Music through 5 pin DIN sync. Generates and reads FSK signals for synchronization with tape recorders to permit accurate multi–track recording.
Software Required: As above.
Suggested Retail: $195.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

MIDI Processing Unit

Computers: Apple][,][+, //e, IBM PC, XT, Portable
Description: Handles all MIDI commands and data transfer from computer to instruments. Allows computer to perform other tasks simultaneously. Provides metronome, external sync to five pin DIN instruments and tape sync. Requires an interface card.
Software Required: Music Recorder Software
Suggested Retail: Unit alone is $350.00. As a package, with interface card and software, $595.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

SMPL System

Computers: Modified VIC 20 (provided)
Description: A system to provide computer automation to the small studio. Includes computer, SMPTE time code generator and reader, automatic punch in/out, drum and synth synchronizer, programmable eight event sequencer, an autolocater, time code metronome and recorder remote control.
Software Required: SMPL System Software/Interface cartridge (provided)
Suggested Retail: $1295.00
Manufacturer: Synchronous Technologies
Distributor: Remenyi House of Music

MC1 Music Card

Computers: Apple][,][+, //e
Description: A three–voice polyphonic music card. Stereo output feeds trough any amplifier. Compositions may be saved to, or loaded from, disk.
Software Required: Included
Suggested Retail: $295.00
Manufacturer: ALF Products, Inc.
Distributor: Remenyi House of Music

MC16 Music Card

Computers: Apple][,][+, //e
Description: A nine–voice polyphonic music card. Music may be edited and stored on disk, or played through any amplification system. Stereo output.
Software Required: Included
Suggested Retail: $295.00
Manufacturer: ALF Products, Inc.
Distributor: Remenyi House of Music

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2 Channel Microcomposer

Computers: N/A
Description: Provides real–time loading from self–contained keyboard or step–time programming from controls. Has 2600 notes capacity in two separate channels, programmable accent, portamento, and tempo control. Has inputs/outputs to drive external analog synthesizer, or to use as an external voice for the Compu Music.
Software Required: None, or Compu Music software.
Suggested Retail: $795.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

Computer Music Survey

MIDI/DCB Multi–Track Keyboard Recorder

Computers: N/A
Description: An eight–track digital recorder with a 6500 note memory. Can record in real time from MIDI or DCB instruments, or in step–time from inherent controls. Records any MIDI data. Allows chaining, merging, overdubbing, bounce tracks and auto correct timing after recording. Allows changing of MIDI channel assignments. Tape interface, five pin DIN sync, external stop/start.
Software Required: N/A
Suggested Retail: $1595.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

MIDI Keyboard Recorder

Computers: N/A
Description: A compact MIDI recorder with a 6100 note memory. Provides real–time recording from MIDI instruments, or step–time from inherent controls. Records all MIDI data. Allows overdubs, single measure editing, erase, insert and delete editing. MIDI channel assignments may be changed. Has tape interface, five pin DIN sync and external start/stop.
Software Required: N/A
Suggested Retail: $850.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

DCB Keyboard Recorder

Computers: N/A
Description: A compact digital recorder with a 2000 note memory, and a DCB interface for Juno–60 and Jupiter–8 keyboards. Allows real–time or step–time loading and up to three overdubs. Records patch changes. Has tape interface, five pin DIN sync, external start/stop and external patch shift.
Software Required: N/A
Suggested Retail: $495.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

Sync Box

Computers: N/A
Description: A SMPTE/MIDI/Click/five pin sync interface for universal synchronization of musical instruments, tape recorders, video and film devices. Reads and writes SMPTE time codes to permit sync with music and video, for example, from any point in a composition or soundtrack. Sends measure identification to any device that can recognise it, such as the digital keyboard recorders. Tempo is controlled from any external source, from tap switch on panel, from the Sync Box's memory, or laid down as SMPTE code on tape. Sync possible with almost any rhythm machine. Remote start/stop. Tape, MIDI in/out/through, and two 5–pin DIN sync out interfaces.
Software Required: N/A
Suggested Retail: $1695.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

Yamaha's DX-9, above.

DCB/MIDI Convertor

Computers: N/A
Description: Converts DCB signals to MIDI, or MIDI to DCB. Has MIDI channel selector to choose which MIDI information is converted to DCB, or onto which MIDI channel to convert DCB information. MIDI–through jack permits set–up as part of larger MIDI network.
Software Required: N/A
Suggested Retail: $295.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

Control Voltage/MIDI Convertor

Computers: N/A
Description: Converts up to eight channels control voltages/gate inputs to MIDI or DCB data. MIDI channel select for single or dual channel select for split keyboards. VCA, VCF control for DCB keyboards.
Software Required: N/A
Suggested Retail: $850.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

MIDI Thru Box

Computers: N/A
Description: A parallel connection box for MIDI setups, with one MIDI in and four MIDI through ports.
Software Required: N/A
Suggested Retail: $95.00
Manufacturer: Roland Canada Music Limited
Distributor: Remenyi House of Music

RX11/RX15 Digital Rhythm Programmers

Computers: N/A
Description: Rhythm programmers that enable digitally recorded percussion stored in ROM to be integrated with other music through MIDI interfacing. RX15 model has 15 separate sounds; the RX11 model has 29. Both models can produce 11 sounds simultaneously. Both models feature the capability of storing 100 individual rhythm patterns in memory for song integration. 10 songs can be held in memory. Patterns and songs can be entered in real–time or through step–write programming procedures. The RX11 can use a RAM cartridge to further storage capabilities. MIDI in/out and tape sync in/out jacks are provided.
Software Required: N/A
Suggested Retail: $1295.00 (RX11); $795.00 (RX15)
Manufacturer: Yamaha
Distributor: Remenyi House of Music

DX1 Digital Synthesizer

Computers: N/A
Description: Provides FM digital synthesis through six operators and 32 algorithms in each of its two voice generator channels. Both banks of 32 voices can be played independently, combined, or split. More voices may be added through the use of ROM cartridges. User may edit ROM voices and store in optional RAM cartridges, or use the cartridges to store original programmed voices. Depending on its setting, the DX1's keyboard is either 16 or 32 note polyphonic and has fully polyphonic portamento and glissando capability. LED and LCD displays. MIDI in/out/through and foot switch/control jacks are supplied.
Software Required: Five ROM cartridges supplied.
Suggested Retail: $14995.00
Manufacturer: Yamaha
Distributor: Remenyi House of Music

DX7 Digital Synthesizer

Computers: N/A
Description: Similar to the DX1, but with 32 built-in voices. Two ROM cartridges of 64 voices supplied. Sounds programmed from scratch may be saved to optional RAM cartridge. Keyboard is 16 note polyphonic with portamento and glissando capability. LED and LCD display. Same I/O as the DX1.
Software Required: Two ROM cartridges supplied.
Suggested Retail: $2795.00
Manufacturer: Yamaha
Distributor: Remenyi House of Music

DX9 Digital Synthesizer

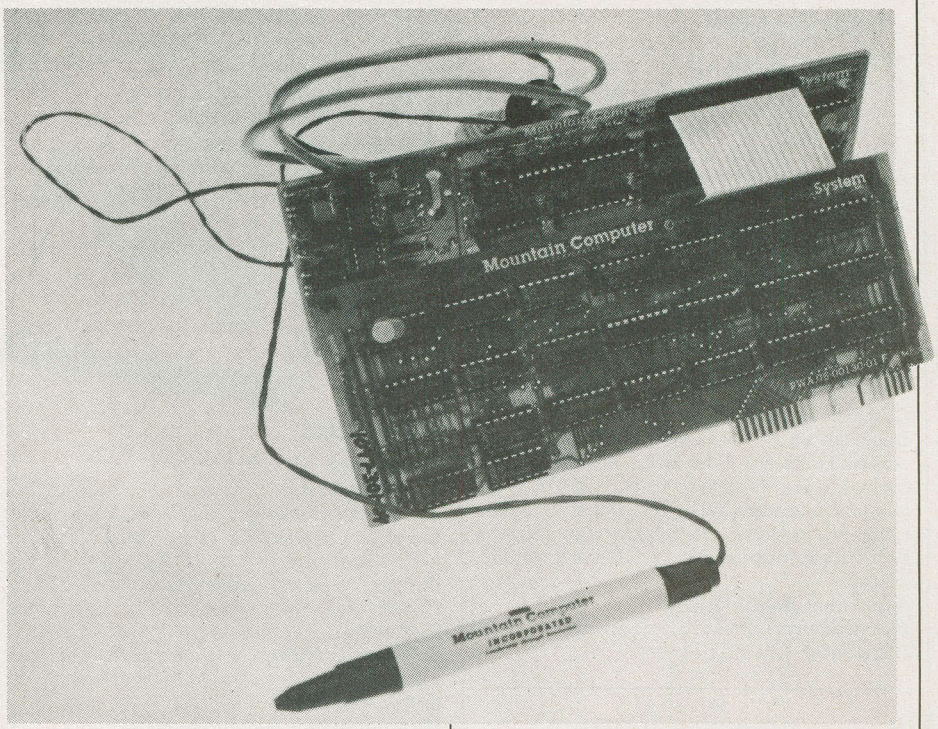
Computers: N/A
Description: The DX9 has a 20 note internal voice memory. Its FM tone generator has four operators and eight algorithms. As with the DX7, up to 16 notes may be played simultaneously. Its primary source of secondary notes is through the accompanying 120 voice cassette tape. Programmed voices may be loaded and saved with the cassette interface. Cartridges are not used. Inherent jacks are MIDI in/out/through, foot switch/control, breath control and cassette in/out/remote.
Software Required: 120 voice data cassette supplied.
Suggested Retail: $1995.00
Manufacturer: Yamaha
Distributor: Remenyi House of Music

KX1 Remote Keyboard

Computers: N/A
Description: An 'over the shoulder' keyboard that interfaces to any DX synthesizer via a 15 meter MIDI cable to allow for user on-stage mobility. The KX1 has 44 keys, can play up to 16 notes simultaneously and has 32 tone selectors. It's powered by batteries, and breath control, DC in and MIDI out connecting terminals.
Software Required: N/A
Suggested Retail: N/A
Manufacturer: Yamaha
Distributor: Remenyi House of Music

KX5 Remote Keyboard

Computers: N/A
Description: Similar in function and purpose to the KX1, but has 37 keys. Inherent terminal connectors are breath control and MIDI out.
Software Required: N/A
Suggested Retail: N/A
Manufacturer: Yamaha
Distributor: Remenyi House of Music



The Mountain Music system consists of two cards which plug into two consecutive slots in the Apple motherboard. The cards hold sixteen complete synthesizers, all software programmable, and a light pen interface.

Mountain Music System

Computers: Apple][,][+, //e
Description: All-digital synthesizer cards with 16 digital oscillators. Programmable waveforms, amplitude, and frequency. System includes synthesizers, light pen, audio connectors and software.
Software Required: Supplied. Other software available.
Suggested Retail: $595.00
Manufacturer: Mountain Computer Incorporated
Distributor: Remenyi House of Music

MIDI Adapter

Computers: N/A
Description: An adapter that enables pianos (some electric, most acoustic) to drive any MIDI compatible synthesizer, sequencer or accessory.
Software Required: N/A
Suggested Retail: N/A
Manufacturer: Forte Music
Distributor: Remenyi House of Music

The Alpha Syntauri system, which includes the Mountain cards above. See next page.

Computer Music Survey

alphaSyntauri

Computers: Apple][,][+, //e
Description: A complete music system utilizing the Mountain Music System synthesizer cards, the Syntauri keyboard and keyboard interface. Keyboard is polyphonic to an eight-voice maximum, covers a five octave range, and is velocity sensitive.
Software Required: AlphaPlus or Metatrak
Suggested Retail: $1995.00
Manufacturer: Syntauri Corporation
Distributor: Remenyi House of Music

Mockingboard

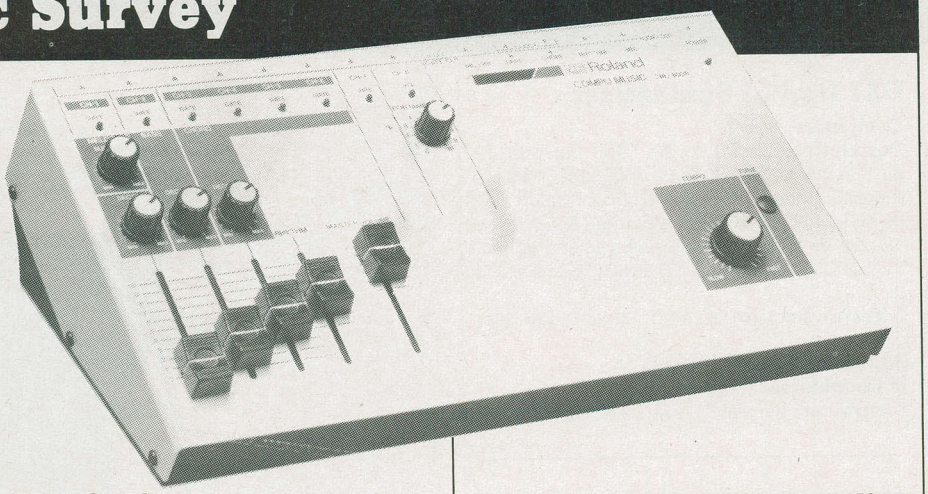
Computers: Apple][,][+, //e
Description: A stereo sound board that also incorporates speech. Two chips of three voices each allow chords up to six notes each. Fully programmable. Supported by a number of Apple programs, including *Music Construction Set*.
Software Required: Supplied. Other programs available.
Suggested Retail: $375.00
Manufacturer: Sweet Micro Systems
Distributor: Citation Software

Classic Keyboard System

Computers: Apple][,][+, //e
Description: A complete music development system including the Classic keyboard, two synthesizer cards and a keyboard interface card. Circuitry allows the system to emulate both the alphaSyntauri system and the Soundchaser keyboard, and consequently it operates under software written for either.
Software Required: Either alphaSyntauri or Soundchaser
Suggested Retail: $995.00
Manufacturer: The Classic Organ Company
Distributor: The Classic Organ Company

PVI Drum Card

Computers: Apple][,][+, //e
Description: Emulates acoustic percussion instruments. Uses an on-board 6502 processor and has 28 different drum sounds in EPROM. Accompanying software allows editing of sounds to be stored on disk or optionally recorded through the card. Riffs can be composed from different sounds and stored on disk or recorded.
Software Required: Editor supplied.
Suggested Retail: $139.95 U.S.
Manufacturer: Ensoniq
Distributor: Ensoniq



ADA Card

Computers: Apple][,][+, //e
Description: An eight-bit analog-digital-analog sound sampling card capable of sequencing up to eight sounds in various patterns up to 35,000 notes. Complements Passport, alphaSyntauri and Classic systems as well. Input from keyboard, microphone or synthesizer.
Software Required: ADA 1 and ADA Mark II included.
Suggested Retail: $275.00
Manufacturer: Pedal Productions
Distributor: Remenyi House of Music

DX-1 Sound Sampling System

Computers: Apple][,][+, //e
Description: For sampling and reproducing ordinary sound under computer control. Any sound can be entered via the card and played back a variety of ways over at least a five octave range. 'Effects][' software (included) has sound samples, preset rhythms, a real-time play feature, a musical keyboard feature, autosequencing, scale tuning and allows enabling/disabling of input and/or output sync pulses. Data may be saved to disk. Interface for Syntauri and Passport keyboards.
Software Required: Included. Other volumes available.
Suggested Retail: $349.00 U.S.
Manufacturer: Decillionix
Distributor: Decillionix

DX-1 Echo

Computers: Apple][,][+, //e
Description: Adds real-time audio processing, echoing and reverb capability to the DX-1 System. The DX-1 Echo turns the host Apple into a digital delay with variable feedback control. Over 40 key-selectable routines for echoing and sound processing are provided. Routines include anything from plain straight echo to cycling sample rate to random echo length. All echo variables can be controlled. Requires the DX-1 Sound Sampling System.
Software Required: Sound processing program included.
Suggested Retail: $149.00 U.S.
Manufacturer: Decillionix
Distributor: Decillionix

The Roland Compu Music. See page 53.

Soundchaser Computer Music System

Computers: Apple][,][+, //e
Description: System includes the four octave Soundchaser Digital keyboard, two Mountain Music synthesizers, and keyboard interface card.
Software Required: Many programs available.
Suggested Retail: $1595.00
Manufacturer: Passport Designs
Distributor: Remenyi House of Music

Mirage Digital Sampling Keyboard

Computers: N/A
Description: A complete digital sampling system with an eight-voice polyphonic keyboard, an on-board sequencer with an RS-232C computer expander port, and a built-in 3 1/2" disk drive. Using an in-house LSI chip (Q-chip), the system offers total control over voltage control filter and envelope generator parameters.
Software Required: Included
Suggested Retail: $1695.00 U.S.
Manufacturer: Ensoniq
Distributor: Ensoniq

Addresses: Citiation Software Incorporated, 1901 Logan Avenue, Winnipeg, Manitoba R2R 0H6 (204) 632-0559 ● The Classic Organ Company, Limited, 300 Don Park Road, Unit 12, Markham, Ontario L3R 3A1 (416) 475-1263 ● Decillionix, P.O. Box 70985, Sunnyvale, California 94086 (408) 732-7758 ● Ensoniq, 263 Great Valley Parkway, Malvern, Pennsylvania 19355 (215) 647-3930 ● Remenyi House of Music, 210 Bloor Street West, Toronto, Ontario M5S 1T8 (416) 961-3111 **CN!**

Moorshead Publications Almost Free Software

Almost Free Software #1

Almost Free Software #2

Almost Free Software #3

Almost Free PC Software #1

Almost Free Software #1, #2 and #3 are for CP/M and are available in a variety of formats: Apple // + CP/M, 8 inch SSSD*, Access Matrix, Morrow Micro Decision, Superbrain, Xerox/Cromemco*, Epson QX-10VD, Sanyo MBC 1000, Nelma Persona, Kaypro II, Osborne Single* and double densities, Televideo, DEC VT-180, Casio FP-1000, Zorba.

*single density formats require two disks. The package cost for these formats is $19.95

For IBM PC's and genuine compatibles. Available in Double-Sided or two Single-Sided Disks.*

Modem7. Allows you to communicate with any CP/M based system and download files. Complete details were in Computing Now! November 1983.

PACMAN. You can actually play PAC-MAN without graphics, and it works pretty fast.

FORTH. A complete up-to-date version of FIG FORTH, complete with its own internal DOS.

DUU. The ultimate disk utility allowing you to recover accidentally erased disk files, fix gorched files, rebuild and modify your system. A real gem.

D. A sorted directory program that tells you how big your files are and how much space is left on the disk.

USQ/SQ. Lets you compress and uncompress files. You can pack about 40% more stuff on a disk with this system.

Finance. A fairly sophisticated financial package written in easily understandable, modifiable Microsoft BASIC.

BADLIM. Ever had to throw out a disk with a single bad sector? This isolates bad sectors into an invisible file, making the rest of the disk useable.

DISK. Allows you to move whole masses of files from disk to disk without having to do every one by hand, you can also view and erase files with little typing.

QUEST. A "Dungeons and Dragons" type game.

STOCKS. This is a complete stock management program in BASIC.

SEE. Also known as TYPE17, will TYPE any file, squeezed or not allowing you to keep documents in compressed form while still being able to read them.

BISHOW. Th ultimate file typer, BISHOW version 3.1 will type squeezed or unsqueezed files and allow you to type files which are in libraries (see LU, below). However, it also pages in both directions, so if you miss something, you can back up and see it again.

LU. Every CP/M file takes up unnecessary overhead. If you want to store lots of data in a small space, you'll want LU, the library utility. It permits any number of individual files to be stored in one big file and cracked apart again.

RACQUEL. Everyone should have one printer picture in their disk collection.

MORTGAGE. This is a very fancy mortgage amortization program which will produce a variety of amortization tables.

NSBASIC. Large disk BASIC packages, such as MBASIC, are great... and very expensive. This one, however, is free... and every bit as powerful as many commercial programs. It's compatible with North Star BASIC, so you'll have no problem finding a manual for it.

Z80ASM. This is a complete assembler package which uses true Zilog Z80 mnemonics. It has a rich vocabulary of pseudo-ops and will allow you to use the full power of your Z80 based machine... much of which can't be handled by ASM or MAC.

VFILE Easily the ultimate disk utility, VFILE shows you a full screen presentation of what's on your disk and allows you to mass move and delete files using a two-dimensional cursor. It has heaps of features, a built-in help file and works extremely fast.

ROMAN. This is a silly little program which figures out Roman numerals for you. However, silly programs are so much fun...

CATCHUM. If you like the fast pace and incredible realism of Pacman, you'll go quietly insane over Catchum... which plays basically the same game using ASCII characters. Watch little "C's" gobble periods while you try to avoid the deadly "A's"... It's a scream.

OIL. This is an interesting simulation of the workings of the oil industry. It can be approached as either a game or a fairly sophisticated model.

CHESS. This program really does play a mean game of chess. It has an on-screen display of the board, a choice of colours and selectable levels of look ahead.

DEBUG. The DDT debugger is good but this offers heaps of facilities that DDT can't and does symbolic debugging... it's almost like being able to step, trace and disassemble through your source listing.

DU87. The older DUU program does have some limitations. This version overcomes them all and adds some valuable capacities. It will adapt itself to any system. You can search, map and dump disk sectors or files. It's invaluable in recovering damaged files, too.

ELIZA. This classic program is a micro computer head shrinker... It runs under MBASIC, and, with very little imagination, you will be able to believe that you are conversing with a real psychiatrist.

LADDER. This is... this program is weird. It's Donkey Kong in ASCII. It's fast, bizarre and good for hours of eye strain.

QUIKKEY. Programmable function keys allow you to hit one key to issue a multi-character command. This tiny utility allows you to define as many functions as you want using infrequently used control codes and to change them at any time... even from within another program.

RESOURCE. While a debugger will allow you to disassemble small bits of code easily enough, only a true text based disassembler can take a COM file and make source out of it again. This is one of the best ones available.

PCWRITE. While not quite Wordstar for nothing, this package comes extremely close to equalling the power of commercial word processors costing five or six bills. It has full screen editing, cursor movement with the cursor mover keypad, help screens and all the features of the expensive trolls.

SOLFE. This is a small BASIC program that plays baroque music. It's also a fabulous tutorial on how to use BASICA's sound statements.

PC-TALK. A Telecommunicatons package for the IBM PC which does file transfers in both ASCII dump and MODEM7/X-MODEM protocols and comes with... get this... 119424 bytes of documentation.

SD. This sorted directory program produces displays which are a lot more readable than those spewed out by typing DIR.

FORTH. This is a small FORTH in Microsoft BASIC. You can build on the primitives intregral with the language.

LIFE. An implementation of the classic ecology game written in 8088 assembler.

MAGDALEN This is another BASIC music program.

CASHACC. This is a fairly sophisticated cash acquisition and limited accounting package written in BASIC. It isn't exactly BPI, but it's a lot less expensive.

DATAFILE. This is a simple data base manager written in... yes, trusty Microsoft BASIC.

UNWS. Wordstar has this unusual propensity for setting the high order bits on some of the characters in the files it creates. Here's a utility to strip the bits and "unWordstar" the test. The assembler source for this one is provided.

HOST2. This is a package including the BASIC source and a DOC file to allow users with Smart-Modems to access their PC's remotely. It's a hacker's delight.

Order as AFS #1 and specify system

Order as AFS #2 and specify system

Order as AFS #3 and specify system

Order as AFPCS #1 Specify Double-Sided or 2x Single-Sided.*

All of this software has been obtained from public access sources and is believed to be in the public domain. The prices of the disks defer the cost of reproducing them and mailing them, plus the cost of the medium. The software itself is offered without charge. A few items include messages imbedded in the code asking for voluntary donations on behalf of the authors.

Moorshead Publications warrants that the software is readable and if there are defects in the medium, we will replace it free of charge. While considerable effort has been made to ensure that programs are thoroughly debugged, we are unable to assist in adapting them for your own applications.

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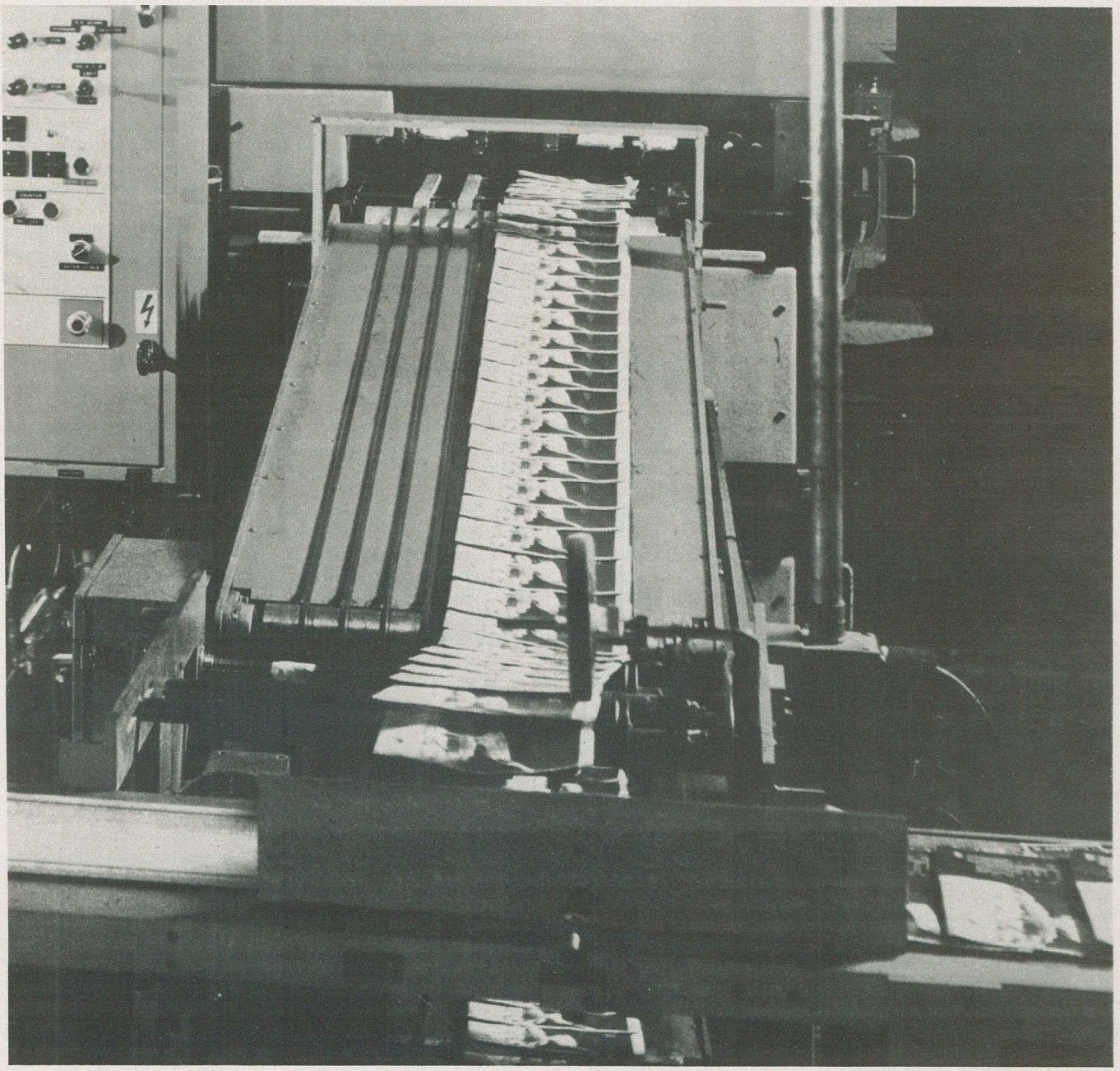
The Silicon Printing Press



Listing text files to hard copy can be either sloppy to the point of baby food or extremely slow. This slab of code, a listing program for CP/M based systems, does away with such mundane things.

by Steve Rimmer

Written words are, by now, a bit retrograde and arcane, especially when compared with the magic of eight bit ASCII data... slick, ethereal winged messenger that it is. There are, however, some applications wherein humans will simply not read what you want them to read from the screen of a terminal.

You really have to be able to handle spewing particles of carbon dust onto the flesh of dead trees in order to attract some peoples' attention.

To this end, we have printers. In order to communicate with the printers we have printer ports and, thereby, printer port driver software. This last bit, it should be noted, is a tad amorphous. Hitting control P will turn many computers into printer drivers of a sort, but the results usually wind up looking like the aftermath of a food fight at the type factory.

The printing functions of many word processors, notably WordStar, are not a whole lot better. WordStar allows for paging

The Silicon Printing Press

the text it spews into hard copy, but it puts the page numbers in a fairly dumb place and makes doing things like headers extremely involved. More to the point, it is profoundly, tediously, excruciatingly, mindlessly, painfully, glacially slow.

This is to say it takes a long time to print.

This month we're going to look at an extremely sophisticated text file listing program. It has a menu to make it human, fast code to make it reasonable and the facility for setting up the fancy options of popular dot matrix printers, allowing one's documents to be printed in condensed doublestruck italics if one feels a need for it.

It also serves to introduce yet another foaming mouthful of macro routines to the already burgeoning cornucopia of BIGMAC, the Computing Now! ongoing utility collection.

Pressed For Time

From the user's point of view, the Silicon Printing Press displays two screens, to wit, an option selection screen and a status screen which happens when the system is actually printing.

The first screen allows you to decide what you want the final document to look like. It would have been possible to have made this thing work as a command line program, that is, with a mass of backslash options and stuff, but this is a whole lot easier to use.

The first thing you'll want to tell the program is what file you have in mind to print. It will immediately attempt to open the file you specify, and, as such, will simply refuse to deal with non-existent file names. This line will accept lower case input, too, as some heads like to save BASIC programs under lower case names.

The next prompt is for WordStar files. These have many characters in them with high order bits... which tend to select weird looking symbols if they get sent to a printer. On the other hand, occasionally one will want to list a file with these characters being legitimately used. As such, you can tell the program whether or not you fancy having the high order bytes snuffed.

The printings which result from all this will have page numbers printed at the top of each page. Very often one will want to start with a page other than page one. The next prompt gets a page number to start with. Anything up to sixty five thousand and change is cool.

The program will accept up to thirty-five characters of header text, that is, a line to be printed at the top of each page. The appropriate dogma can be entered into a buffer at the forth options page prompt.

Finally, you get to select the type style and size you want the file to ooze out as. In this version of the program, the printer can be commanded to produce compressed, medium and wide type and italic, medium and bold characters. The list could have included underlined text as well, except that very few applications call for a whole document being printed out riddled with underscores.

The options, where it's cool, do reasonable defaults. Obviously hitting RETURN when it asks you for a file name will confuse the poor bit bucket to no small end, but the rest of the prompts can be blasted with null entries. The program defaults to printing WordStar files, starting at page one, in medium, regular sized type.

The program as show here is set up to handle Gemini 10 print codes, but it can be modified fairly easily for other systems, as all the pertinent bytes are at the top of the file.

Power of Print

The Silicon Printing Press makes extensive use of macro calls... you will need MAC, rather than ASM, to get it together. This reduces the apparent complexity of the code by an order of magnitude... while, albeit, increasing the size of the resultant object file by about the same factor. The program assembles into an eight K COM file.

In order to get this together you will need an up to date version of BIGMAC.LIB, as begun in the July 1984 edition of Computing Now! and added to in subsequent issues. It will have to be added to again, installing the additional macro routines slithering about listing two.

Also be warned that this thing takes a particularly long time to assemble. The machine isn't hanging up... it's just checking out a particularly large table of symbols. Because of the size of the program, you will want to suppress the generation of the symbol table and printer listing by doing

MAC PRESS $PZ SZ

when you assemble it.

To get into the grotty details, let's start off by looking at the new macros which this program calls for. While a few of these have been added simply to make programming with BIGMAC a bit less barbaric... the GOTO macro, for example, is simply a JMP instruction... the new calls largely form the nexus of the PRESS program. The source file itself has relatively little assembly level code in it, being primarily a host of new words.

The first group of macros handles the output to the printer. PRNDEC prints a decimal value to the printer... it is, in fact, simple DECOUT with the TYPE call replaced with LTYPE. The LTYPE macro sends one character to the LST: device.

The LPRINT macro sends a string to the printer. It is analogous to PRINT, but works in a slightly different way, inasmuch as it is rarely the case that one wants to LPRINT a predefined literal in the same way that one often sends text to the screen. As such, LPRINT prints the string pointed to by its parameter, ADDR, and terminated by a null.

The INCR and DECR macros... only INCR is used in this program... serve to make variable handling a bit easier by allowing for the quick manipulation of sixteen bit values in memory.

UPPER insures that any ASCII alphabetic characters passing through it will come out in upper case. It's rarely useful by itself, but, rather, gets called by other macros.

GETCHR, which sucks in keyboard characters, is similar to CONIN, except that it returns the character in A without echoing it to the tube.

STRG prints a string of characters to the screen. In keeping with the quasi-BASIC syntax we've been using it should have been called STRING, but this word is used quite frequently as a macro parameter.

There are two levels of line input in these macros. The simplest is INPUT, which is a specialized version of the BASIC instruction. It takes in keyboard data, echoing it to the tube, and finally stashes the whole works in a buffer, pointed to by the ADDR parameter. However, to make it more useful, there are two optional parameters allowed by the macro, STRING and CSE. If you provide a string in STRING, only characters within the string will be accepted by input. The CSE parameter can be filled in with anything you like... as long as it isn't null, the UPPER macro will be included in the call, and everything will come in upper case no matter how it's typed.

The LENGTH parameter sets the maximum allowable length for inputted data, after which only backspaces and carriage returns will be considered.

INLINE is a fancier INPUT, doing a formatted input routine. Finally, STRSCAN is a component of INPUT which scans a string for the character in A.

Listing 1

```
;MACMACMACMACMACMACMACMACMACMACMACMACMACMACMACMAC
;
;       The Silicon Printing Press
;       Copyright 1984 (c) Steve Rimmer
;
;       Caution: This program may explode
;       on contact with suits
;
;MACMACMACMACMACMACMACMACMACMACMACMACMACMACMACMAC

        MACLIB  BIGMAC
        DEFINES
PPOS    EQU     4               ;HORIZONTAL PROMPTS
EPOS    EQU     36              ;ENTRIES
XCHR    EQU     BRK             ;CHARACTER TO QUIT
        ORG     0100H
        INTRO                   ;SET UP STACK
        GOTO    START           ;JUMP OVER FIXED DATA

;       PRINTER STRINGS (Change these to suit your toys)

PRINTER DB      'Gemini 10X',0
INITIAL DB      ESC,64,0                ;INITIALIZE
BOLD    DB      ESC,53,ESC,'E',0        ;SET BOLD MODE
MED     DB      ESC,53,ESC,'F',0        ;SET MEDIUM TYPE
ITAL    DB      ESC,52,0                ;SET ITALIC MODE
COND    DB      15,0                    ;SET TINY TYPE
NORM    DB      20,0                    ;SET NORMAL TYPE
WIDE    DB      ESC,14,0                ;SET WIDE TYPE

;       BUFFERS

FILEBUF DS      14              ;FILE NAME GOES HERE
        DB      NULL
WSFLAG  DS      1               ;WORDSTAR FLAG
PGNUM   DS      2               ;CURRENT PAGE COUNT
HEADER  DS      35              ;HEADER TEXT
        DB      0
SZE     DB      'M'             ;TYPE SIZE FLAG
FONT    DB      'M'             ;FONT FLAG
LINPAG  DW      0               ;NUMBER OF LINES/PAGE
CHRCNT  DW      0001H           ;NUMBER OF CHARACTERS
LNCNT   DW      0001H           ;NUMBER OF LINES PAGE PRINTING
PGCNT   DW      0001H           ;NUMBER OF PAGES
POSCNT  DB      1               ;HORIZONTAL POSITION
CURCHAR DS      1               ;CHARACTER TO BE PRINTED
PAGIT   DB      '   --   Page ',0       ;SLOTH
NEWLINE DB      CR,LF,LF,0


;       SUBMARINES (There is water at the bottom of the ocean)

PRNHEAD:
;SEND THE HEADER TO THE PRINTER
        LPRINT  INITIAL         ;RESET ALL OPTIONS
        LPRINT  BOLD            ;SET BOLD
        LPRINT  HEADER          ;PRINT HEADER
        LPRINT  PAGIT           ;PRINT "PAGE"
        PRNDEC  PGCNT           ;SEE NUMBER
        CALL    DEFPRN          ;RESTORE DEFAULTS
        LPRINT  NEWLINE         ;DOWN A BIT
        RET

DEFPRN:
;SET UP THE DEFAULT PRINTER CODES
```

The Silicon Printing Press

```
        LDA     SZE                     ;GET SIZE FLAG
        CPI 'C' ! JNZ DEF1              ;SMALL?
        LPRINT  COND                    ;DO IT
        GOTO    DEF3
DEF1    CPI 'L' ! JNZ DEF2              ;MEDIUM?
        LPRINT  WIDE                    ;DO IT
        GOTO    DEF3
DEF2    LPRINT  MED                     ;MUST BE NORMAL
DEF3    LDA     FONT                    ;GET FONT
        CPI 'B' ! JNZ DEF4              ;BOLD?
        LPRINT  BOLD
        GOTO    DEF6
DEF4    CPI 'I' ! JNZ DEF5              ;MEDIUM?
        LPRINT  ITAL                    ;DO IT
        GOTO    DEF6
DEF5    LPRINT  NORM                    ;MUST BE NORMAL
DEF6    RET

STATUS:
;DISPLAY THE CURRENT STATUS LINE
        SAVER
        LDA     CURCHAR         ;GET CURRENT CHARACTER
WSTRIP  ANI     7FH             ;STRIP OFF WORDSTAR BITS

        SWITCH  CRT,NOSEE       ;SEE IF FORMFEED
        LTYPE                   ;SEND TO THE PRINTER
        SWITCH  CR,LINERET      ;SEE IF CARRIAGE RETURN
        SWITCH  TAB,TABCHR      ;SEE IF TAB
        SWITCH  LF,LINFEED      ;SEE IF LF
        CPI ' ' ! JM NOSEE      ;DON'T SHOW OTHER CHRS ON TUBE
        TYPE                    ;SEND TO THE SCREEN
        INCR    CHRCNT          ;INCREMENT NUMBER OF CHARACTERS
        LXI H,POSCNT ! INR M    ;INCREMENT POSITION COUNT
NOSEE   RESTR
        RET

LINERET GOTOXY  EPOS,8
        PRINT   <'  ',BS,BS>    ;CLEAN UP TUBE
        DECOUT  CHRCNT          ;SHOW CURRENT CHARACTER COUNT
        GOTOXY  EPOS,9
        PRINT   <'  ',BS,BS>
        DECOUT  LNCNT           ;SHOW CURRENT LINE COUNT
        GOTOXY  EPOS,10
        PRINT   <'  ',BS,BS>
        DECOUT  PGCNT           ;SHOW CURRENT PAGE COUNT
        MVI A,1 ! STA POSCNT
        PRINT   'Page number to start '
        GOTOXY  PPOS,13
        PRINT   'Header text: '
        GOTOXY  PPOS,14
        PRINT   'Size (Compressed, Medium, Large) '
        GOTOXY  PPOS,15
        PRINT   'Font (Medium, Italic, Bold) '
        GOTOXY  PPOS,16
        PRINT   'Lines per page (default 60) '

FILEIT  GOTOXY  EPOS,10
        PRINT   '['
        STRG    ' ',16
        PRINT   ']'                     ;PLACE BRACKETS
        STRG    BS,16
        MAKFCB  FILEIT                  ;GET FILE NAME TO FCB
        OPEN    FILEIT                  ;OPEN FILE, GUESS AGAIN IF
        GOTOXY  EPOS,11                 ; ...OPEN ERROR
        INLINE  WSFLAG,1,'YN',NULL      ;GET WORDSTAR FLAG
        GOTOXY  EPOS,12
        INLINE  DMA,6,'0123456789'      ;GET NUMERICAL DATA ONLY
        DECIN   DMA                     ;GET BINARY VALUE
        SHLD    PGCNT                   ;STORE IN PAGE BUFFER
        GOTOXY  EPOS,13
        INLINE  HEADER,35
        GOTOXY  EPOS,14
        INLINE  SZE,1,'CML',NULL        ;GET ANSWER, FIXED SET,
        GOTOXY  EPOS,15                 ; ...UPPER CASE ONLY
        INLINE  FONT,1,'MIB',NULL
        GOTOXY  EPOS,16
        INLINE  DMA,6,'0123456789'
        DECIN   DMA                     ;DECIN RETURNS IN HL, SO
        SHLD    LINPAG                  ; ...STASH HL REGISTER

        GOTOXY  20,22
        PRINT   'Hit any key to roll them presses '
        CONIN                           ;WAIT FOR A CHARACTER

        LDA     WSFLAG                  ;FILTHY SELF MODIFYING
        SWITCH  'Y',ROLLEM              ; ...CODE TO HANDLE WORDSTAR
        MVI     A,0FFH                  ; ...HIGH ORDER BIT STRIP
        STA     WSTRIP+1

ROLLEM  CLRSCRN                         ;CLEAR THE TUBE
        CALL    PRNHEAD                 ;SHOW FIRST HEADER
        LHLD    LINPAG                  ;GET LINES/PAGE
        LXI     D,0                     ;IS IT SET TO ZERO?
        COMPARE PAGSET                  ;IF SO, SET TO DEFAULT
        LXI     H,60                    ;
        SHLD    LINPAG

PAGSET  GOTOXY  PPOS,8
        PRINT   'Characters printed'
        GOTOXY  PPOS,9
        PRINT   'Lines this page'
        GOTOXY  1,5             ;PLACE CURSOR FOR NEW LINE
        STRG    ' ',160         ;CLEAN UP LINE
        GOTOXY  1,5             ;REPLACE CURSOR
        GOTO    NOSEE           ;CARRY ON

TABCHR  TYPE
        LDA POSCNT ! ADI 8 ! STA POSCNT ;BUMP COUNTER
        GOTO    NOSEE

LINFEED INCR    LNCNT           ;INCREMENT LINE COUNT
        LHLD    LNCNT           ;GET NEW LINE COUND
        XCHG                    ;INTO D
        LHLD    LINPAG          ;GET LINES / PAGE INTO H
        COMPARE NOSEE           ;IF NOT EQUAL, QUIT
        INCR    PGCNT           ;... INCREMENT PAGE COUNT
        LXI H,1 ! SHLD LNCNT    ;RESET LINE COUNT
        LTYPE   FF
        CALL    PRNHEAD         ;SHOW THE HEADER
        GOTO    NOSEE

SEEBUF:
;SHOW THE BUFFER CONTENTS
        LXI     H,DMA           ;POINT TO DMA BUFFER
        MVI     B,80H           ;GET LENGTH IN B
BLOOP   GETCHR                  ;SEE IF CHARACTER WAITING
        SWITCH  XCHR,BLENDER    ;ABORT IF CTRL C
        MOV     A,M             ;GET CHARACTER
        SWITCH  EOF,BLENDER     ;QUIT IF END OF FILE
        STA     CURCHAR         ;SAVE IT
        CALL    STATUS          ;SHOW STATUS LINE
        LDA     CURCHAR
;       LST                     ;SEND TO PRINTER
        INX     H               ;POINT TO NEXT BYTE
        LOOP    BLOOP           ;DECREMENT AND KEEP GOING
        MVI     A,XCHR+1        ;MAKE SURE NO ABORT
BLENDER RET

;       ZE CODE ("Ve haf vaysof making you yodel...")

START   SETDMA  0080H           ;SET UP DMA BUFFER
        CLRSCRN                 ;CLEAR TUBE
        BOX     1,1,79,23       ;PRINT A FRAME
        GOTOXY  15,4
        PRINT   '[ The Silicon Printing Press version 2.45 ]'
        GOTOXY  20,5
        PRINT   'Copyright 1984 (c) Steve Rimmer'
        GOTOXY  26,6
        PRINT   'For the '
        LXI     H,PRINTER
        PSTR
        GOTOXY  PPOS,10
        PRINT   'File name '
        GOTOXY  PPOS,11
        PRINT   'Wordstar File (Y or N) '
        GOTOXY  PPOS,12
        GOTOXY  PPOS,10
        PRINT   'Page number'
        GOTOXY  PPOS,12
        PRINT   'Header text: '
        LXI     H,HEADER
        PSTR
        GOTOXY  PPOS,15
        PRINT   <'Hit control ',XCHR+40H,' to quit.'>
        GOTOXY  1,5

READIT  SREAD   ENDFL           ;READ SECTOR
        CALL    SEEBUF          ;DISPLAY AND PRINT
        CPI     XCHR            ;SEE IF REQUENT TO SCOOT
        JZ      ENDFL           ;IF SO, BE GONE
        GOTO    READIT
ENDFL   GOTOXY  PPOS,20
        PRINT   '[ Print complete... exiting to CP/M ]'
```

```
        LPRINT  INITIAL         ;RE-INITIALIZE THE PRINTER
        CLOSE                   ;CLOSE THE FILE
        GOTOXY  1,22

QUIT    EXTRO   60              ;STACK AND ALL
        END
```

Where's The Beef

Understanding what the macros do, it should be fairly simple to relate to the program. The functional aspect of it... the part that sends files to the printer... is actually extremely simple, being all down at the very bottom of the program beginning with the label READIT. It runs for five lines.

In essence, all one needs to do to send a file to the printer is to open the file, read in a sector, send the sector to the LST: device one byte at a time and then read in the next sector, repeating the process as needs be. If you try to read in a sector which is past the end of the file the read call will return with an error flag set, which is the signal to scoot out, close the file and quit.

That's about what this little bit of code does. All the tricky bits take place in SEEBUF, the routine that takes each byte, evaluates it and deals with it according to the wisdom of the sages.

The file handling macros in BIGMAC all work with the same basic parameters. They manipulate file names in the default FCB, down at 005CH, and pass data through the standard CP/M DMA buffer at 0080H. As such, the workings of SEEBUF are pretty simple. It simply scans from 0080H to 00FFH, a one hundred and twenty-eight byte sector, and takes each byte at a time over to the routine which will deal with the text at the character level... the fuming, three eyed STATUS routine.

Having gotten a character out of the DMA buffer, SEEBUF will need it several times. It must be evaluated by STATUS as well as checked by SEEBUF to determine whether the end of the file has been reached part way through a sector. This is quite common... files rarely end on even sector boundaries... and is indicated by the presence of a control Z end of file character.

As such, there is a buffer, CURCHAR, which holds the currently important character. Data is passed to STATUS in this way, rather than being transmitted in the A register.

Most of the macros in BIGMAC preserve the sixteen bit registers, but trash the accumulator and flags.

The action of STATUS will vary depending upon the character it is handling. Printable characters are sent to the printer. They are also displayed on the screen, as the printing press will always display the line of text currently being sent to the great beyond.

Control characters are largely ignored, with the exception of line feeds, form feeds, tabs and carriage returns. Form feeds are removed, as the program inserts its own. Tabs are treated specially mostly for cosmetic reasons in dealing with the screen display. Carriage returns are also trapped for the tube... they reset the line being displayed.

Line feeds are the most important control characters, as it is on the execution of a line feed that the program updates all of its status registers... and the displays thereof... and checks itself out to see if it's supposed to do something special. This, for the most part, involves creating new pages if its current line count has reached the page length defined during the program setup.

If the program decides it has reached the moment of division, it will call PRNHEAD, which prints a header at the top of the new page. This, in turn, prints the appropriate strings to the printer to get it to set itself up for bold type, to print the header and to call PRNDEC... remember ol' PRNDEC, the chewable macro... to display the page number.

The PRNHEAD routine also has to call DEFPRN. This is some code which reads the contents of the size and font flags and prints the appropriate control strings as a result. Since we cannot know what the document is supposed to look like when the program is written... it's set by the user, returning from printing the header requires that the default type conditions be restored.

The only other aspect of the code which may look a little bizarre is the handling of the WordStar bits. WordStar files are usually littered with characters which are a hundred and twenty-eight larger than they should be, that is, that their high order bits are set. This is WordStar's way of doing some internal house keeping. Masking off these bits is easy... one does an ANI 7FH. However, because the masking of these bits is optional, depending on what went down in the setup section, the program can't do this all the time.

While it would have been possible to have the program conditionally jump over the ANI instruction, this would have been a bit cumbersome to write. The cheap and nasty way is just to have the routine change the 7FH to 0FFH if the high order bits are to be left alone. This is handled right before the ROLLEM label.

Listing 2

```
PRNDEC  MACRO   ADDR
;VALUE IN HL WILL BE PRINTED IN DECIMAL ON THE PRINTER
        LOCAL   DEC1, DEC2, DECL
        JMP     DECL
DEC1    SAVER                   ;SAVE ALL REGS
        LXI B,-10 ! LXI D,-1
DEC2    DAD B ! INX D ! JC DEC2
        LXI B,10 ! DAD B ! XCHG
        MOV A,H ! ORA L ! CNZ DEC1
        MOV A,E ! ADI '0'
        LTYPE
        RESTR
        RET
DECL    IF NOT NUL ADDR
        LHLD    ADDR
        ENDIF
        CALL    DEC1
        ENDM
;
LTYPE   MACRO   CHR
;SEND A OR CHR TO PRINTER
        SAVER
        PUSH    PSW
        IF NOT NUL CHR
        MVI     A,CHR
        ENDIF
        MVI C,5 ! MOV E,A ! CALL 5
        POP     PSW
        RESTR
        ENDM
;
LPRINT  MACRO   ADDR
;SEND STRING OR STRING IN HL TO PRINTER
        LOCAL   LLOOP,ENDSTR
        IF NOT NUL ADDR
        LXI     H,ADDR
        ENDIF
LLOOP   MOV A,M ! CPI 0 ! JZ ENDSTR
        LTYPE
        INX H ! JMP LLOOP
ENDSTR  ENDM
;
PSTR    MACRO
;PRINT STRING IN H TIL NUL
        LOCAL   PSLP, ENDPS
PSLP    MOV     A,M
        CPI     0
```

The Silicon Printing Press

```
        JZ      ENDPS
        TYPE
        INX     H
        JMP     PSLP
ENDPS   ENDM
;
INCR    MACRO   ADDR
;INCREMENT A SIXTEEN BIT ADDRESS
        SAVER
        LHLD    ADDR
        INX     H
        SHLD    ADDR
        RESTR
        ENDM
;
DECR    MACRO   ADDR
;DECREMENT A SIXTEEN BIT ADDRESS
        SAVER
        LHLD    ADDR
        DCX     H
        SHLD    ADDR
        RESTR
        ENDM
;
UPPER   MACRO
;MAKE LOWER CASE A INTO UPPER CASE
        LOCAL   ENDMAC
        CPI     61H
        JC      ENDMAC
        CPI     7BH
        JNC     ENDMAC
        ANI     5FH
ENDMAC:
        ENDM
;
GOTO    MACRO   ADDR
        JMP     ADDR
        ENDM
;
GETCHR  MACRO
;GET A CHARACTER IN A FROM CONSOLE
        SAVER
        MVI C,6 ! MVI E,0FFH ! CALL 5
        RESTR
        ENDM

STRG    MACRO   CHAR,LONG
;PRINT A STRING OF CHAR LEN LONG
        LOCAL   LLOOP
        SAVER
        IF NOT NUL LONG
        MVI     B,LONG
        ENDIF
LLOOP   MVI     A,CHAR
        TYPE
        LOOP    LLOOP
        RESTR
        ENDM
;
INLINE  MACRO   ADDR,LENGTH,STRING,CASE
;DO FORMATTED LINE INPUT
;TEXT GOES TO BUFFER, MATCHES TO STRING, MAXIMUM LENGTH
        SAVER
        PRINT   '['
        STRG    ' ',LENGTH+1
        PRINT   ']'
        STRG    BS,LENGTH+1
        INPUT   ADDR,LENGTH,STRING,CASE
        RESTR
        ENDM
;
STRSCAN MACRO   STRING,ADDR
;IF A IS NOT IN STRG, JUMP TO ADDR
        LOCAL   LLOOP,NOMATCH,ENDIT,STRX
        SAVER
        MOV     B,A
        LXI     H,STRX
LLOOP   MOV     A,M
        SWITCH  NULL,NOMATCH
        CMP     B
        JZ      ENDIT
        INX     H
        JMP     LLOOP
STRX    DB      STRING,NULL
NOMATCH RESTR
        MOV     A,B
        JMP     ADDR
ENDIT   MOV     A,B
        RESTR
        ENDM
;
INPUT   MACRO   ADDR,LENGTH,STRING,CSE
;DO LINE INPUT. TEXT GOES IN BUFFER ADDR,
;MAXIMUM LENGTH, MATCHES TO STRING IF SUPPLIED
;TRANSLATES TO UPPER CASE IF NOT NULL
        LOCAL   GETCH,DELT,ALLDONE
        SAVER
        STRG    ' ',LENGTH
        STRG    BS,LENGTH
        FILL    ADDR,ADDR+LENGTH,NULL

        LXI     H,ADDR
        MVI     B,LENGTH
GETCH   GETCHR
        SWITCH  CR,ALLDONE
        SWITCH  BS,DELT
        IF NOT NUL CSE
        UPPER
        ENDIF
        IF NOT NUL STRING
        STRSCAN STRING,GETCH
        ENDIF
        IF NUL STRING
        CPI 32 ! JM GETCH
        CPI 'z'+1 ! JP GETCH
        ENDIF
        MOV C,A ! MOV A,B ! CPI 0
        JZ GETCH ! MOV A,C
        TYPE
        MOV M,C ! INX H ! DCR B ! JMP GETCH
DELT    MOV A,B ! CPI LENGTH ! JZ GETCH
        PRINT   <BS,' ',BS>
        DCX H ! INR B ! JMP GETCH
ALLDONE MVI A,LENGTH ! SUB B
        RESTR
        ENDM
;
;ADD TO DEFINES MACRO
FF      EQU     'L'-40H
```

Stop The Presses

The silicon printing press is a lot easier to use than is WordStar, and capable of producing considerably cooler results with less setting up and cajoling. Furthermore, having the source code, you can alter it as you require.

At the same time, the facilities of BIGMAC are considerably enhanced by these additional macros, making it fairly adept at handling keyboard input and hard copy output. While hardly as simple as BASIC, using this collection of macros is a great deal easier than programming exclusively in assembler.

You may not have tried writing a decimal conversion routine as yet... it's one of the collosal head benders of our age. **CN!**

Moorshead Publications Software Services

Stockboy Inventory Control Package

When we first advertised this program, we would have been pleased with a fraction of the orders we received. On reflection we should have appreciated what a bargain it is. Inventory programs are generally pretty expensive and some of them are inflexible and some even badly engineered. You may find that even small inventories generate enrormous files.

Stockboy is a good, powerful, flexible bargain-priced package which will handle inventory for small businesses. We use Stockboy within Moorshead Publications for our own inventory control and it has stood the test of time.

Stockboy can:

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- **Produce individual packing lists.**
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- **Run on any CP/M or MS-DOS based computer, even an Apple II running with a softcard.**

Stockboy is written in Microsoft BASIC, and is designed to be easily altered to suit your needs. It can be compiled using BASCOM if you desire. It is designed for use by non-technical operators.

Available for: CP/M and PC formats

$29.95 most systems **$34.95** for 8"

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MDM730

MDM730 is one of the most powerful MODEM7 programs available . . . and the Computing Now! version of MDM730 incorporates features not available in the public domain editions. If you are into telecommunications, bulletin boards and downloading software your life will be full and meaningful with this code. For background on MDM730, see July 1984 Computing Now!. Consider the facilities.

- Terminal program which works at any baud rate.
- Ten programmable macro function keys.
- Thirty six number phone library.
- Christensen software transfer protocol.
- User settable toggles for line feeds, ON-XOFF and so on.
- Extensive help menus.
- Baud rate selection on the fly (or the spider).
- ASCII dump and capture.
- Status menu
- Many more features.

In addition to all this splendor, however, we've added dialing support for the Apple version. While the standard MDM730 cannot dial unless it's hooked to a Hayes Smartmodem, we've added patches to it to allow it to do pin twenty five pulse dialling and to dial through the Hayes Micromodem II and the SSM card. The Computing Now! MDM730 will also

- Select a number from the library and dial it
- Accept a hand entered number and dial it
- Wait for carrier
- Log you onto the remote system if it's free
- Optionally autodial if the remote board is busy.
- Count the number of attempts at dialling the remote BBS.

The Computing Now! MDM730 package is available for

- The Hayes Micromodem II.
- The SSM 300 Baud modem card.
- The PDA 232C serial card with external modem.

The PDA 232C package includes versions supporting both the Smartmodem and a dumb modem with pin twenty five line control, such as the Novation AutoCat.

Also included with each package are utilities to permit easy alteration of the phone number library and the function key macro strings plus an extensive documentation file.

The source code file for this program is over a hundred and fifty kilobytes long. It cannot be hacked on a standard Apple. We patched it on a larger machine and downloaded it. As such, we're pretty sure that MDM730 with these features is unavailable elsewhere.

Available for: Apple II + CP/M 2.2. systems

TRS-80 Model II (complete with the above applicable features)

Please specify modem version from above list. **$29.95**

Ontario residents add 7% PST.

Fine Print:
The original MDM730 code is in the public domain. We are offering this part of the program without cost. The charges for this package are for the patches created by Computing Now! and to defer the cost of handling and postage.

This software is guaranteed to work correctly if properly applied. The serial cards on Apple and compatible systems must be installed in slot two with at least 48K of RAM running Microsoft CP/M 2.2. The PDA 232C version will require the availability of either a Hayes Smart-Modem or a modem with pin twenty five line control to dial. Users of the SSM card version may experience some difficulty in detecting extremely faint carriers on older versions of this card.

Formats

Where **CP/M** is shown, the following formats are available:

Apple II + CP/M (see below)
Access Matrix, Morrow Micro Decision, Superbrain, Xerox/Cromenco*, Epson QX-10VD, Sanyo MBC1000, Nelma Persona, Kaypro II, Osborne Single Density*, Osborne Double Density, Televideo, DEC VT-180, Casio FP-100, Zorba, 8 inch SSSD*

*Software marked with an asterisk is the higher price quoted.

MDM730 for the Apple II + CP/M requires two disks and is at the higher price.

PC
Available for the IBM PC and genuine compatibles.

AppleDOS
For Apple II + and genuine compatible systems.

TRS-80 Model II CP/M
Will operate under either Lifeboat or Pickles and Trout CP/M.

Apple Wordstar Fixer

Apples and Wordstar are not entirely friendly. Apple compatible systems equipped with Videx type eighty-column cards do a number of unpleasant things to this popular word processor. While there are simple cures for this... they all involve some delicate code hacking.

The Fixer solves this problem. Place it on the same disk as your copy of WS.COM, type FIXER and after a suitable amount of disk noise version 3.0, you will have APWS.COM on there too. This version of Wordstar includes special patching and unhooking code which runs each time you boot Wordstar, and makes your fruit behave as it should. It releases the control K's, translates the left arrow key to a delete character, and patches Unitron keyboards.

In additional all of this, the fixer allows you to set some of the defaults of Wordstar which the MicroPro INSTALL Package doesn't really get to. All of these features are menu driven in English for absolute non-technical operation.

Fixed Wordstar will run in either 44K or 56K CP/M.

Available for:
Apple II + CP/M only. **$19.95**

Ontario Residents add 7% P.S.T.

DOSDIAL

The Apple Terminal Package

There are plenty of terminal programs for the Apple II and its emulators. Some dial, some download. However, only DOSDIAL is this splendidly cheap.

DOSDIAL is a hybrid Applesoft and machine code package for fast operation and easy modification. It features a phone number library and automatic dialing. It operates on any fruit with a PDA 232C serial card and an autodial modem. A complete source file of the assembler code is included to allow it to be quickly patched for other serial cards.

Will work on any Apple + or compatible system with a PDA 232C serial card and an autodial modem.

Available for:
Apple II + **$16.95**

Ontario residents add 7% PST

A Teacher for the Apple

Specifically developed for the educational market, this 5-1/4" disk introduces both teachers and students to the Apple +, IIe and compatible systems.

It is designed to show you how to make the computer work for you.

After introducing you to the computer, it goes on to explain the BASIC programming language and step-by-step instructions show you the ins-and-outs of programming this system and using its many features including disk operating systems and high resolution graphics.

This program is designed for the total novice and it is designed to work accordingly. All you do is turn the computer on, slide in the disk and it takes over!

Requires Applesoft BASIC, 48K RAM and one disk drive.

Available for:
AppleDOS only **$35.00**

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Software Services,
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MuGraph for the Apple

Grabbing a joystick, a handful of light dependent resistors and keying in this Applesoft program will not only produce real music from your Apple's speaker... it may get you evicted. String some blinking Christmas tree lights up around your Apple and you'll end up with a coming out party which will deafen the neighbours.

by Jim Dawson

Somewhere back in the depths of time someone invented the Theremin. For a while it looked as if the Theremin was going to replace all of the Stradivarii, Wurlitzers and counter bassoons the world around, but then that particular new wave of music died a natural death and music buffs reverted to slapping disks recorded with more or less normal sounding instruments onto their turntables. This, though, was before the advent of the personal computer and Star Wars.

The Theremin was an instrument made of two copper plates and a black box which contained masses of electronics including a couple of radio frequency oscillators. These radiated energy at almost... though not quite... the same frequency, and the copper plates were the plates of the externally mounted tuning capacitors. The musician flailed his arms about wildly somewhere near the plates resulting in a banshee-like wail which rose and fell alarmingly in pitch and volume as the presence or absence of the musician's hands changed the capacitance of the plates. This changed the radio frequencies produced by the oscillators... a matter of deliberate drift... and hence the resultant audio frequency note produced by beating the two radio frequencies together.

Since the advent of the Apple and similar fruit, and now that our ears have become more accustomed to electronic noises accepted as music, the time has clearly come to replace the theremin with something more fitting the 'eighties. This article is about getting your Apple to respond musically to stimuli from the outside world in the form of light.

Light Entertainment

Among the goodies at your local Radio Shack is catalogue number 276-1638, "five assorted opto detectors". These items are, in reality, resistors whose resistance values vary with the amount of light falling on them. The purchase of a package of

these things is the starting point of in getting your micro to respond to light.

The theory behind LDRs is briefly this... uhm, you can skip over this explanation if you want to. If radiation falls on a semiconductor, its conductivity increases. Covalent bonds are broken by being ionized and hole electron pairs in excess of those generated thermally are created. The increase in the number of current carriers results in the conductivity increasing or, if you wish, in the resistance decreasing.

Electron hole pairs are created when the material in the resistor is hit by high energy photons... light particles... through a process called intrinsic excitation. While other types of excitation are possible, it is this one which is of interest here.

Resistance of the devices you will find in the package of five referred to above will vary from several megohms, the dark resistance, to only a few ohms for their light resistances. For starters you can pick one of the smaller ones in the package for this project. The one I liked had a range from one megohm to two hundred ohms in bright light... but you can experiment with any of the others at any time since they all work. Each will respond differently to the same amount of light.

Lit with a sixty watt bulb three feet away, the light resistance of the resistors in my package varied from eight kilohms to two hundred and fifty ohms.

In short, the problem involved in this project entails putting the resistor you select somewhere light can get to it and then to connecting it to your Apple. A long time ago I concluded that Steve Wozniak had thought that users of his brainchild would never want to do more than permanently plug in a set of game paddles into the machine's game I/O port and play Little Brick Out from that point on. Since then times have changed.

The Apple //e and later models' game I/O ports are easily accessible from the backs of the machines and won't need the breakout box described in this article. If you own one of these things, or you have some way of communicating with your micro other than through the keyboard and the game plug, you can skip the next few paragraphs and get down to some programming.

If, however, you have only the sixteen pin interior game plug, read on. You are about to start on a coming out party for your Apple. The breakout box does nothing more than take your game plug outside the Apple where you can get at it easily.

Stepping Out Tonight

Figure one shows the pinout arrangement used in the Apple game plug. The breakout box which is required for this thing calls for some sixteen conductor ribbon cable, two DIP sockets and a DIP header. If you're not keen on stripping and soldering ribbon cable, you can buy a DIP jumper cable at Radio Shack... a sixteen conductor cable equipped with two male DIP plugs, part number 276–1976... and save some time. The only disadvantage to this is that the cable they supply is rather too short for real convenience.

The object of the exercise at this point is to connect the light dependant resistor you selected from your package of five in place of one of the game paddles. The program refers to PDL(1), but any of the four available, from PDL(0) to PDL(3), could have been used equally well.

Speakeasy

Apples do not, in general, make nice noises without some effort from humans. Plucking the speaker by PEEKing –16336 can produce a rasping note of sorts at a frequency of about seventy hertz in Applesoft or two hundred and fifty hertz in Integer BASIC. To produce said rasp, one might type

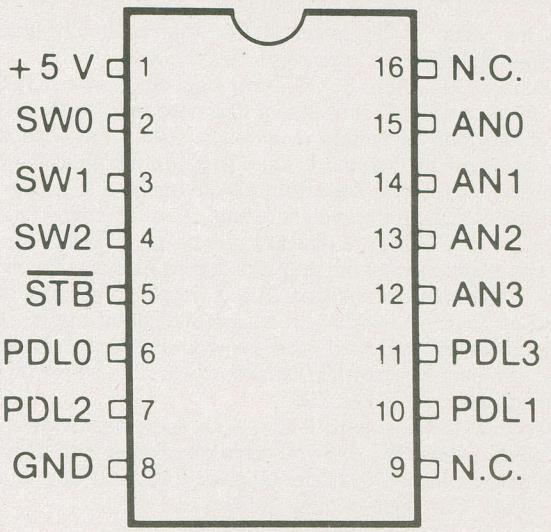

Figure 1 The Apple II game port

```
10 X=PEEK(-16336):GOTO 10
```

The limitation on frequency is imposed by the speed of the BASIC languages. Neither Applesoft nor Integer BASIC can provide the speed of operation needed to make musical notes. Only machine language can operate at the required rate. You can, however, POKE the required values into memory from BASIC and call the speaker plucking routine at $C030 from the BASIC program.

In this program, memory locations 864 to 891 $360 to $37B, which are normally free, are used to hold the values required for the machine language subroutine. Lines 30 to 50 read the data contained in lines 730 to 750 and then POKE memory locations 864 to 891 with the needed values.

The page one high resolution screen is selected and cleared in line 70 to provide a graphical display of the notes to be played as you hear them, and white is chosen as the colour.

Lines 90 and 100 can be interchanged. Leaving them as they are listed below, a bargraph representation of the music played is output to the screen. Interchanging them results in a normal graph with point to point plotting of the notes produced.

In line 110 the game controller you wish to use is selected. Paddle 0 is used in this listing, but any of the four available could be used equally well. The program reads the value at location PDL(0) and uses this value to derive P, the name given to the variable used in actually making a note. The value at PDL(0) normally ranges from zero to two hundred and fifty.

If you are interested in technical things, when hex location $C070 is referenced by either a read or write operation, bit seven at four memory locations... corresponding to the four paddle locations... is set to logic one. At this instant four capacitors connected to a 558 IC inside the Apple begin to charge from the positive fifteen volt pin of the game I/O through four resistors, the game control potentiometers located normally in your paddle. The value of these resistances is, of course, variable, and the length of time for the capacitors to reach two thirds of the five volt maximum depends on the value of the resistances in question, that is, on the setting of paddles. At the two thirds full charge

MuGraph for the Apple

point, the value of bit seven at the appropriate location in memory will flip from a logic one to a logic zero.

Locations $C064 to $C067, corresponding to pins GC0 to GC3 on the game I/O are, in fact, the ones used to report the state of the four capacitors in question. When the capacitors reach their nominal two thirds full charge, bit seven at the corresponding location changes from a logic one to a logic zero.

In line 120 the horizontal increment, X, is determined as being X+L. This results in a different rate of displacement for the horizontal component of the graphics display as the value for the length of the note, L, changes. The X value could have been defined as X=X+1 resulting in a slightly different display. L is obtained from the keyboard once the program starts. Initially set at one, any letter key hit while the program is running results in a different value for L in line 200.

Normally the keyboard letters A through E provide more than enough range for L, but you could press other letter keys for longer notes. Pressing the letter A gives L a value of one, B a value of two, C a value of three, and so on.

```
10  HOME
20 L = 1:X = 0
30  FOR ML = 864 TO 891
40  READ MC
50  POKE ML,MC
60  NEXT ML
70  HGR : HCOLOR= 3
80  VTAB 22: HTAB 10: PRINT "LET THERE BE
LIGHT...!"
90  HPLOT X,130
100  PRINT ;
110 P =  PDL (1)
120 X = X + L
130  IF X =  > 279 THEN X = 1: GOTO 70
140 P =  INT (P / 6)
145 K =  PEEK ( - 16287): IF K < 128 THEN
145
170  GOSUB 280
180  IF P = 8 THEN 100
190  IF P = 254 THEN 100
200 L =  PEEK ( - 16384) - 192
210  IF L < 1 THEN L = 1
215  POKE 864,L
220  POKE 865,P
230  CALL 866
240 P =  INT ( ABS (256 - P) / 2)
250  HPLOT  TO X,P
260  GOTO 100
270  END
280  ON P GOTO 290,300,310,320,330,340,350
,360,370,380,390,400,410,420,430,440,450,4
60,470,480,490,500,510,520,530,540,550,560
,570,580,590,600,610,620,630,640,650,660,6
70,680,690,700,710,720,104
290 P = 8: RETURN
300 P = 24: RETURN
310 P = 39: RETURN
320 P = 52: RETURN
330 P = 63: RETURN
340 P = 74: RETURN
350 P = 85: RETURN
360 P = 95: RETURN
```

```
370 P = 105: RETURN
380 P = 115: RETURN
390 P = 125: RETURN
400 P = 134: RETURN
410 P = 143: RETURN
420 P = 151: RETURN
430 P = 159: RETURN
440 P = 166: RETURN
450 P = 172: RETURN
460 P = 177: RETURN
470 P = 182: RETURN
480 P = 187: RETURN
490 P = 192: RETURN
500 P = 197: RETURN
510 P = 202: RETURN
520 P = 206: RETURN
530 P = 210: RETURN
540 P = 214: RETURN
550 P = 218: RETURN
560 P = 222: RETURN
570 P = 225: RETURN
580 P = 228: RETURN
590 P = 231: RETURN
600 P = 234: RETURN
610 P = 237: RETURN
620 P = 239: RETURN
630 P = 241: RETURN
640 P = 243: RETURN
650 P = 246: RETURN
660 P = 248: RETURN
670 P = 250: RETURN
680 P = 252: RETURN
690 P = 253: RETURN
700 P = 254: RETURN
710 P = 8: RETURN
720 P = 1: RETURN
730  DATA  0,115,172,97,3,174,97,3,232,208
,253,169
740  DATA  4,32,168,252,173,48,192,136,208
,239,206
750  DATA  96,3,208,231,96
760  REM ********************************
***
770  REM ***      LET THERE BE LIGHT
***
780  REM ***                BY
***
790  REM ***           JIM  DAWSON
***
800  REM ***         ORMSTOWN - QUEBEC
***
810  REM  ********************************
***
```

Take a Note...

What about the notes themselves? A note is, when all is said and done, an audio frequency sustained for a given length of time. The time during which a note will be held has been determined by L already.

The value POKEd into location 865 determines the audio frequency, the note, which will be produced by this program. If the notes produced are to correspond to a chromatic scale, values

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MuGraph for the Apple

for P corresponding to twenty–four, G in the top line of the bass clef, to two hundred and fifty–three, or B flat three octaves above middle C, are required.

The values for P must be specific values, however. The analog value obtained for P initially in line 110 must be modified. Since some forty–two notes are available to us in the range selected, the original range of P... zero to two hundred and fifty–five... is modified in line 140. We now have a range for P of one to forty–two. The ON P GOTO statement in line 280 gives us the new value for P in one of the forty–two steps required to produce a specific note from our scale. P is POKEd into memory location 865 in line 220 and the note producing subroutine at 866 is CALLed in line 230.

One problem this program does not attempt to deal with is the unfortunate relationship between the time during which a note will sound and its frequency. Regardless of the value we choose for L, the duration of a note, the Apple insists on making notes at the two extremes of the scale shorter than those in the middle range. Some compensation has, in fact, been made in the machine language routine at 866, but any further improvement would call for a much more complex algorithm than the one I've used.

Meanwhile, there is the problem of the screen representation of the graphic form of our music. Some of the values for P reported from the GOSUB at line 280 would bring things to a crashing halt if we did not limit them for the screen. P is to be plotted on the Y axis and must, therefore, not exceed the limitations of the Apple high resolution screen. A maximum value for P for plotting purposes is obtained in line 240 by dividing P by two, and, to have the graph plot logically, with the low notes at the bottom and the high notes at the top, the value is further modified in the same line using the P=INT(ABS(256–P)/2) algorithm.

The Procedure

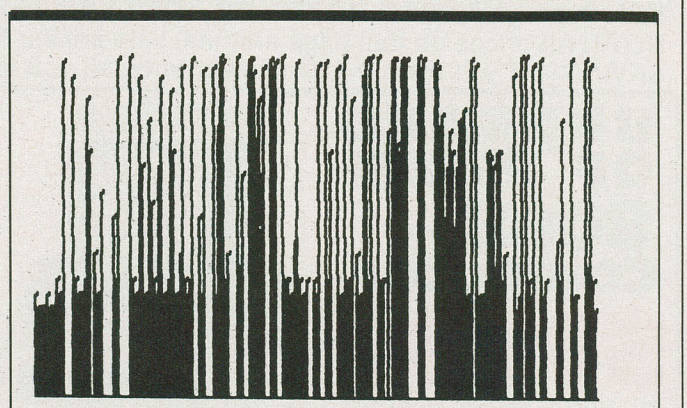
A couple of stiff fine wires placed in the appropriate holes of the socket on your breakout box will allow you fasten a pair of wires leading to the light dependant resistor. I used speaker wire equipped with alligator clips at each end. The leads of a small disc ceramic capacitor are ideal for the job of fitting into the DIP socket. The capacitor can be left intact and some rigidity results thereby... see figure five. The smallest of your five LDRs, because it is less sensitive to light than the others, can be mounted directly in the holes of the DIP socket.

The LDR itself... if you don't select the very smallest one... should be placed in some sort of translucent container shielded from much of the ambient light. I used a plastic box which had once contained some thirty–five millimeter colour slides. Even that box did not shield the LDR sufficiently... these gadgets are *very* sensitive to light... and it was necessary to tape most of the box with surgical tape to cut down on the amount of light reaching the resistor.

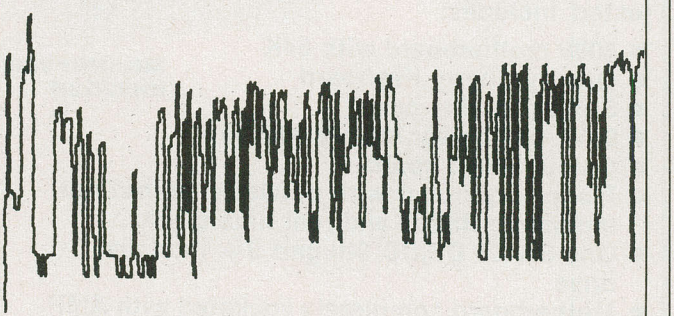
If too much or too little light hits the LDR, lines 180 and 190 send the program back to line 100 and no note is produced at the extreme ends of the scale. This provides for the rest notes, periods of silence, so essential to music of any kind. A further rest could be intercalated at line 195 by PEEKing –16287, the location for Pushbutton 0. If the pushbutton is depressed, the value at this location will be greater than one hundred and twenty–seven. A line like

```
K=PEEK(–16287):IF K►127 THEN 100
```

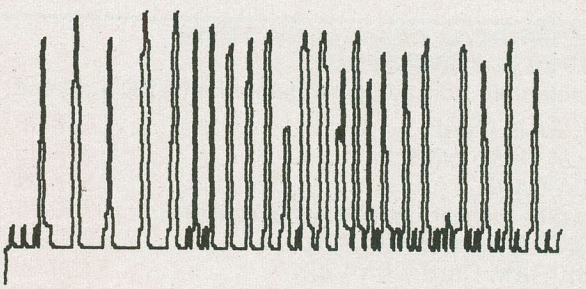
would do the job nicely.

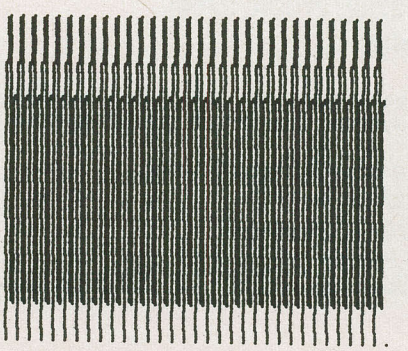


90 HPLOT X, 130
100 PRINT;

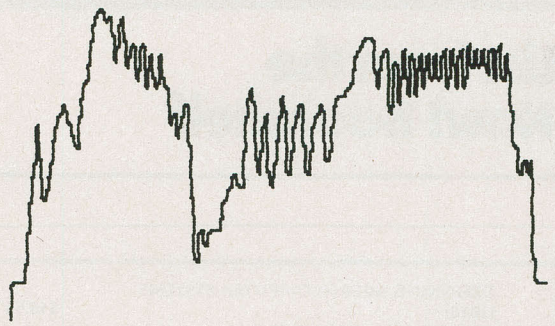


90 PRINT;
100 HPLOT X, 130

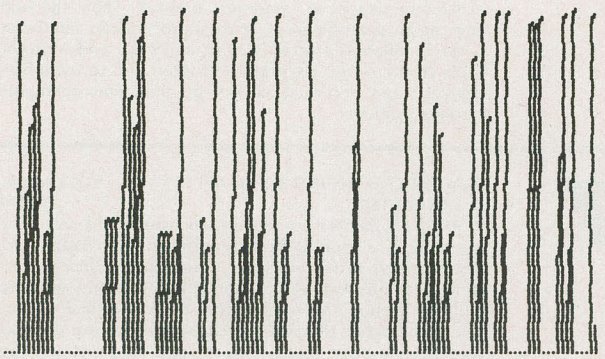




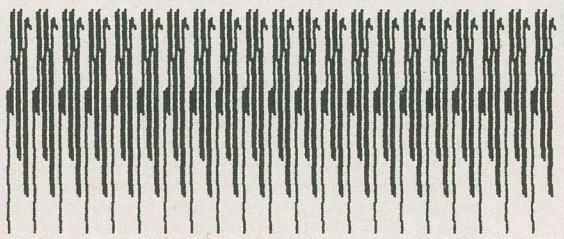
TAN PLOT



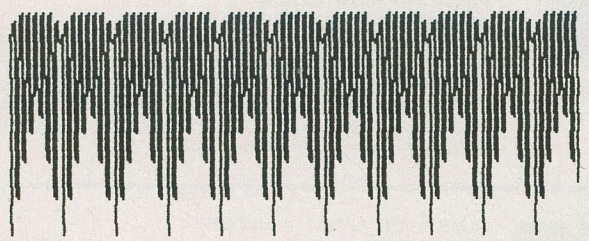
90 HPLOT X, 130
100 PRINT;



90 PRINT;
100 HPLOT X, 130



COSINE PLOT



SINE PLOT

These plots are representative of some of the variations available under MuGraph.

Once you are familiar with what a single light dependant resistor can do in terms of producing notes, you may want to use a second one. The limit is, of course, four. A second one attached to leads in the PDL(0) holes would be referenced with P0=PDL(0), a third with P3=PDL(3), and so on. You might arrange your algorithm in such a way that P0 will produce high notes when the light dependant resistor attached to the PDL(0) holes is lit.

Putting both resistors in the same box will produce an alternating set of notes, one high, one low, with a given amount of light. Using a different box for each will let you use both hands to control the notes produced, each hand working independently of the other.

With four light dependant resistors connected, the whole family can play at once. The resulting cacophony defies imagination.

Inserting a control G in the program can have interesting effects. Try adding line 255 PRINT "" with one or more control G's in the quotation marks. Two will provide the base for a waltz rhythm. If the pitch of the speaker beeper isn't pleasing, substitute a fixed value for P in place of the control G and send the program off to a subroutine to produce the sound you want. Values of twenty–four, thirty–nine, and fifty–two fit in well with this idea.

Other Songs

There are other applications for this technology, of course. While it's an interesting artistic exercise, it also lends itself to allowing your Apple to monitor the real world in a number of ways. Sensors for quite a number of quantities return varying resistance values.

A light dependant resistor can make your Apple into a darkroom exposure meter, replete with software to compensate for varying grades of paper and the temperature of the developer. You can read this with a temperature dependant resistor, if you want to be very slick.

One device you might want to experiment with in terms of connecting the outside world to your computer is the Radio Shack adjustable current source temperature sensor IC, catalogue number 276–1734. This versatile little spud, looking exactly like a typical transistor, promises all sorts of potential uses in making your micro listen to the world around it and in producing appropriate responses. There is nothing to stop you from turning your Apple into a thousand dollar thermometer, for instance, or a a fire alarm. Serious laboratory uses come to mind at once in applications involving temperature control of procedures.

You can have fun, too, by substituting mathematical formulae to produce values for P. Instead of P=PDL(0) substitute something like

```
FOR I=1 TO 90 : P=ABS(INT(TAN(I)*100))
```

There is nothing to stop you at this point from 'playing' the mortgage interest table for your house or the oestrus cycles of your pet hamsters in D minor.

Like somebody's unfinished symphony, this is an unfinished program. Where it goes from here is up to you and your imagination. **CN!**

References: *Apple][User's Guide, Lon Poole, Osborne/McGraw–Hill, 1983*

New & Revised

Computing Now! Bookshelf

Top 10 Best Seller List from the Computing Now! Bookshelf

1

THE BASIC CONVERSIONS HANDBOOK FOR APPLE, TRS-80, AND PET USERS BRAIN BANK
HB17 **$14.50**
Convert a BASIC program for the TRS-80, Apple II, or PET to the form of BASIC used by any other one of those machines. This is a complete guide to converting Apple II and PET PROGRAMS TO TRS-80 and PET programs to Apple II, TRS-80 and Apple II programs to PET. Equivalent commands are listed for TRS-80 BASIC (Model I, Level II), Applesoft BASIC and PET BASIC, as well as variations for the TRS-80 Model III and Apple Integer BASIC.

2

HOW TO TROUBLESHOOT AND REPAIR MICROCOMPUTERS
AB013 **$12.95**
Learn how to find the cause of a problem or malfunction in the central or peripheral unit of any microcomputer and then repair it. The tips and techniques in the guide can be applied to any equipment that uses the microprocessor as the primary control element.

3

APPLE MACHINE LANGUAGE PROGRAMMING
AB009 **$19.95**
The best way to learn machine language programming the Apple II in no time at all. The book combines colour, graphics, and sound generation together with clear cut demonstrations to help the user learn quickly and effectively.

4

BP-109: THE ART OF PROGRAMMING THE 1K ZX81
M. JAMES and S.M. GEE **$7.60**
This book shows you how to use the features of the ZX81 in programs that fit into the 1K machine and are still fun to use. Chapter Two explains the random number generator and uses it to simulate coin tossing and dice throwing and to play pontoon,. Chapter Three shows the patterns you can display using the ZX81's graphics. It's animated graphics capabilities, explored in Chapter Four, have lots of potential for use in games of skill, such as Lunar Lander and Cannonball which are given as complete programs. Chapter Five explains PEEK and POKE and uses them to display large characters. The ZX81's timer is explained in Chapter Six and used for a digital clock, a chess clock and a reaction time game. Chapter Seven is about handling character strings and includes three more ready-to-run program — Hangman, Coded Messages and a number guessing game. In Chapter Eight there are extra programming hints to help you get even more out of your 1K ZX81.

5

SB21862-APPLE® INTERFACING **$16.95**
Describes the internal Apple II control signals available for I/O interfacing and shows you how to use them with Applesoft BASIC to control devices and communicate with other computers, modems, serial printers, and more. Furnishes real, tested interfacing circuits that work, plus complete breadboarding to help you check out your own interfacing ideas.

6

DESIGNING MICROCOMPUTER SYSTEMS
HB18: **$18.95**
POOCH AND CHATTERGY
This book provides both hobbyists and electronic engineers with the background information necessary to build microcomputer systems. It discusses the hardware aspects of microcomputer systems. Timing devices are provided to explain sequences of operation in detail. Then, the book goes on to describe three of the most popular microcomputer families: the Intel 8080. Zilog Z-80, and Motorola 6800. Also covered are designs of interfaces for peripheral devices, and information on building microcomputer systems from kits.

7

SB21846: ENHANCING YOUR APPLE® II — VOLUME 1
D. LANCASTER **$25.50**
Who but Mother Nature or Don Lancaster could successfully enhance an Apple? YOU can, with help from Volume 1 in Don's newest series for Sams Among other things, you'll learn (1) to mix text, LORES, and HIRES together anywhere on the screen in any combination, (2) how to make a one-wire modification that will open up whole new worlds of 3-D graphics and other special effects, plus (3) a fast and easy way to tear apart and understand somebody else's machine language program. Other goodies abound!

8

BP86: AN INTRODUCTION TO BASIC PROGRAMMING TECHNIQUES **$7.75**
This book is based on the author's own experience in learning BASIC and in helping others, mostly beginners, to program and understand the language. Also included are a program library containing various programs. Also included are a program library containing various programs, that the author has actually written and run. These are for biorhythms, plotting a graph of Y against X, standard deviation, regression, generating a musical note sequence and a card game. The book is complemented by a number of appendices which include test questions and answers on each chapter and a glossary.

9

PH131: ZAP! POW! BOOM!
ARCADE GAMES FOR THE VIC 20
T-HARTNELL & M. RAMSHAW (1983) **$16.95**
Move through the maze eating dots with MAZEMAN. Sail through space zapping the ASTROIDS Outshoot the fastest draw in town GUNFIGHT. Owners of the VIC 20 can now play these games — and more — simply by following the programs outlined in this handy guide.

10

SB21959: THE APPLE® II CIRCUIT DESCRIPTION **$32.50**
Provides you with a detailed circuit description of the Apple II motherboard, including the keyboard and power supply. Comes complete with timing diagrams for major signals and discussion of differences between the various revisions. Good for technicians, serious hobbyists, and others with some knowledge of digital hardware.

See order form on page 80

Computing Now! Bookshelf

BEGINNERS

BP115: THE PRE-COMPUTER BOOK $7.60
Aimed at the absolute beginner with no knowledge of computing, this entirely non-technical discussion of computer bits and pieces and programming is written mainly for those who do not possess a microcomputer but either intend to one day own one or simply wish to know something about them.

A CONSUMER'S GUIDE TO PERSONAL COMPUTING AND MICROCOMPUTERS, SECOND EDITION
FREIBERGER AND CHEW
HB14 $15.95
The first edition was chosen by Library Journal as one of the 100 outstanding sci-tech books of 1978. Now, there's an updated second edition!

Besides offering an introduction to the principles of microcomputers that assumes no previous knowledge on the reader's part, this second edition updates prices, the latest developments in microcomputer technology, and a review of over 100 microcomputer products from over 60 manufacturers.

THE ESSENTIAL COMPUTER DICTIONARY AND SPELLER
AB011 $9.95
A must for anyone just starting out in the field of computing, be they a businessman, hobbyist or budding computerist. The book presents and defines over 15,000 computer terms and acronyms and makes for great browsing.

BEGINNER'S GUIDE TO COMPUTER PROGRAMMING
TAB No.574 $15.95
Computer programming is an increasingly attractive field to the individual, however many people seem to overlook it as a career. The material in this book has been developed in a logical sequence, from the basic steps to machine language.

HB131: THE BEGINNER'S GUIDE TO BUYING A PERSONAL COMPUTER $5.95
Written for the potentially interested computer buyer, in non-technical language, this affordable book explains the terminology of personal computers, the problems and variables to be discussed and discovered while making that initial buying decision. The book does not make recommendations, but does present a great deal of information about the range of hardware avialable from the largest personal computing manufacturers. Readers discover the meaning and impact of screen displays, tape cassette storage and disk storage, graphics and resolution, and much more. Comparison charts clearly define standard and optional features of all the current mass market personal computers.

MICRO-PROCESSORS

A BEGINNER'S GUIDE TO COMPUTERS AND MICROPROCESSORS — WITH PROJECTS.
TAB No.1015 $13.95
Here's a plain English introduction to the world of microcomputers — it's capabilities, parts and functions . . . and how you can use one. Numerous projects demonstrate operating principles and lead to the construction of an actual working computer capable of performing many useful functions.

BP66: BEGINNERS GUIDE TO MICROPROCESSORS AND COMPUTING $7.50
E.F. SCOTT, M.Sc., C.Eng.
As indicated by the title, this book is intended as an introduction to the basic theory and concepts of binary arithmetic, microprocessor operation and machine language programming.

There are occasions in the text where some background information might be helpful and a Glossary is included at the end of the book.

BP72: A MICROPROCESSOR PRIMER $7.70
E.A. PARR, B.Sc., C.Eng., M.I.E.E.
A newcomer to electronics tends to be overwhelmed when first confronted with articles or books on microprocessors. In an attempt to give a painless approach to computing, this small book will start by designing a simple computer and because of its simplicity and logical structure, the language is hopefully easy to learn and understand. In this way, such ideas as Relative Addressing, Index Registers etc. will be developed and it is hoped that these will be seen as logical progressions rather than arbitrary things to be accepted but not understood.

HANDBOOK OF MICROPROCESSOR APPLICATIONS
TAB No.1203 $15.95
Highly recommended reading for those who are interested in microprocessors as a means of a accomplishing a specific task. The author discusses two individual microprocessors, the 1802 and the 6800, and how they can be put to use in real world applications.

BP102: THE 6809 COMPANION $7.60
M. JAMES
The 6809 microprocessor's history, architecture, addressing modes and the instruction set (fully commented) are covered. In addition there are chapters on converting programs from the 6800, programming style, interrupt handling and about the 6809 hardware and software available.

SB21877: MICROPROCESSOR CIRCUITS, VOLUME 1: FUNDAMENTALS AND MICROCONTROLLERS $13.95
Intended for service technicians, computer technicians, industrial control personnel, students, hams, and others who need to learn microprocessor basics. Brings you a chance to learn microprocessor theory and gain valuable practical experience at the same time! Excellent for home study and in-plant training. Features actual demonstration circuits easily built with solderless boards and readily available chips and parts.

AN INTRODUCTION TO MICROPROCESSORS EXPERIMENTS IN DIGITAL TECHNOLOGY
HB07: $18.95
SMITH
A "learn by doing" guide to the use of integrated circuits provides a foundation for the underlying hardware actions of programming statements. Emphasis is placed on how digital circuitry compares with analog circuitry. Begins with the simplest gates and timers, then introduces the fundamental parts of ICs, detailing the benefits and pitfalls of major IC families, and continues with coverage of the ultimate in integrated complexity — the microprocessor.

DIGITAL INTERFACING WITH AN ANALOG WORLD
TAB No. 1070 $15.95
You've bought a computer, but now you can't make it do anything useful. This book will tell you how to convert real world quantities such as temperature, pressure, force and so on into binary representation.

MICROPROCESSOR INTERFACING HANDBOOK: A/D & D/A
TAB No.1271 $15.95
A useful handbook for computerists interested in using their machines in linear applications. Topics discussed include voltage references, op-amps for data conversion, analogue switching and multiplexing and more.

BASIC

BASIC COMPUTER PROGRAMS IN SCIENCE AND ENGINEERING
GILDER
HB08 $19.95
Save time and money with this collection of 114 ready-to-run BASIC programs for the hobbyist and engineer. There are programs to do such statistical operations as means, standard deviation averages, curve-fitting, and interpolation. There are programs that design antennas, filters, attenuators, matching networks, plotting, and histogram programs.

SB22047: 26 BASIC PROGRAMS FOR YOUR MICRO $16.95
Features 26 previously unpublished, simple-to-complex games you can run on almost any brand of microcomputer as long as you have enough RAM on board. Most take between 500 and 5000 bytes, with the highest taking 13K. Conversion charts that let you key them into your Radio Shack, TRS-80, Apple II, Timex/Sinclair 1000 (ZX81), Spectrum, Atari, or PET are included. Also features notes on program techniques and structures.

Tab1533: GRAPHICS PROGRAM IN MICROSOFT BASIC $19.25
Generate computer art including mathematically defined art and animated graphics; draw still pictures — realistic and abstract; create an interactive space shuttle simulation; plot architectural and landscape drawings with both high and low resolution graphics; construct a 3-dimensional model of a function; plot 2-dimensional graphics, statistical relations, maps and diagrams. All these are written in Microsoft BASIC that is adaptable to just about any BASIC micro system.

THE MOST POPULAR SUBROUTINES IN BASIC
TAB No.1050 $10.95
An understandable guide to BASIC subroutines which enables the reader to avoid tedium, economise on computer time and makes programs run faster. It is a practical rather than a theoretical manual.

COMPUTER PROGRAMS IN BASIC
AB001 $14.95
A catalogue of over 1,600 fully indexed BASIC computer programs with applications in Business, Math, Games and more. This book lists available software, what it does, where to get it, and how to adapt it to your machine.

THE BASIC COOKBOOK.
TAB No.1055 $9.95
BASIC is a surprisingly powerful language . . . if you understand it completely. This book, picks up where most manufacturers' documentation gives up. With it, any computer owner can develop programs to make the most out of his or her machine.

BASIC FROM THE GROUND UP
SIMON
HB15 $19.95
Here's a BASIC text for high school students and hobbyists that explores computers and the BASIC language in a simple direct way, without relying on a heavy mathematical backbround on the reader's part. All the features of BASIC are included as well as some of the inside workings of a computer. The book covers one version of each of the BASIC statements and points out some of the variations, leaving readers well prepared to write programs in any version they encounter. A selection of exercises and six worked out problems round out the reader's experience. A glossary and a summary of BASIC statements are included at the end of the book for quick reference.

MISCELLANEOUS

Z-80 AND 8080 ASSEMBLY LANGUAGE PROGRAMMING
SPRACKLEN
HB05 $18.95
Provides just about everything the applications programmer needs to know for Z-80 and 8080 processors. Programming techniques are presented along with the instructions. Exercises and answers included with each chapter.

Tab 1389: MACHINE AND ASSEMBLY LANGUAGE PROGRAMMING $14.95
This book assumes no prior programming knowledge and starts by explaining the advantages of ML. Several sample programs are included and each chapter ends with a quiz to check your understanding of that section.

SARGON: A COMPUTER CHESS PROGRAM SPRACKLEN
HB12 $27.50
"I must rate this chess program an excellent buy for anyone who loves the game. "Kilobaud.

Here is the computer chess program that won first place in the first chess tournament at the 1978 West Coast Computer Faire. It is written in Z-80 assembly language, using the TDL macro assembler. It comes complete with block diagram and sample printouts.

PH180: 1983 CANADIAN BUSINESS GUIDE TO MICRO-COMPUTERS
K. DORRICOTT $11.95
Written by the managing director of Deloitte, Haskins & Sells, a Canadian partnership of public accountants and other professional advisors to management, this book is one of the most complete comprehensive guides to microcomputers available. Starting with a general overview of microcomputers and their business applications, the author helps you assess your computer needs, compares and evaluates computer systems and application packages, and gives you tips on "doing it right" A must for anyone thinking of purchasing a microcomputer for business.

HOW TO PROFIT FROM YOUR PERSONAL COMPUTER: PROFESSIONAL, BUSINESS, AND HOME APPLICATIONS
LEWIS
HB01 $18.95
Describes the uses of personal computers in common business applications, such as accounting, managing, inventory, sorting mailing lists, and many others. The discussion includes terms, notations, and techniques commonly used by programmers. A full glossary of terms.

PH181: THE DATA BASE GUIDE
C.BENTON $26.00
Complete step-by-step book detailing the necessary elements for selecting organizing and implementing database systems for microcomputers. Presents material at a beginner's level yet thorough enough to aid the professional data processing person.

BUSINESS

PH203: THE POWER OF MULTIPLAN™ MANAGEMENT INFORMATION SOURCE $19.95
Covers Accounts receivable, invoicing, cost recovery production scheduling estimating, checkbook, and engineering problem solving accounts payable, payroll, monthly sales report, inventory and financial forecast.

PH206: dBASE II USER'S GUIDE
A. GREEN $38.00
This instructional handbook for novices and experienced users alike presents a simple, highly effective approach to learning how to use this powerful software program avialable for microcomputers.

BASIC COMPUTER PROGRAMS FOR BUSINESS: STERNBERG (Vol. 1)
HB13 $21.50
A must for small businesses utilizing micros as well as for entrepreneurs, volume provides a wealth of practical business applications. Each program is documented with a description of its functions and operation, a listing in BASIC, a symbol table, sample data, and one or more samples.

GENERAL

S-100 BUS HANDBOOK
HB19: $25.50
BURSKY
Here is a comprehensive book that exclusively discusses S-100 bus computer systems and how they are organized. The book covers computer fundamentals, basic electronics, and the parts of the computer. Individual chapters discuss the CPU, memory, input/output, bulk-memory devices, and specialized peripheral controllers. It explains all the operating details of commonly available S-100 systems. Schematic drawings.

See order form on page 80

HB116: THE BASIC CONVERSIONS HANDBOOK FOR APPLE™, TRS-80™, and PET™ USERS
BRAIN BANK **$14.50**
A complete guide to converting Apple II and PET programs to TRS-80, TRS-80 and PET programs to Apple II, and TRS-80 and Apple II programs to PET. Equivalent commands are listed for TRS-80 BASIC (Model I, Level II), Applesoft BASIC, and PET BASIC, as well as variations for TRS-80 Model III and Apple Integer BASIC. Also describes variations in graphics capabilities.

TROUBLESHOOTING MICROPROCESSORS AND DIGITAL LOGIC
TAB No.1183 **$15.95**
The influence of digital techniques on commercial and home equipment is enormous and increasing yearly. This book discusses digital theory and looks at how to service Video Cassette Recorders, microprocessors and more.

MICROCOMPUTERS AND THE 3 R'S
DOERR
HB09 **$15.95**
This book educates educators on the various ways computers, especially microcomputers, can be used in the classroom. It describes microcomputers, how to organize a computer-based program, the five instructional application types (with examples from subjects such as the hard sciences, life sciences, English, history, and government), and resources listings of today's products. The book includes preprogrammed examples to start up a microcomputer program; while chapters on resources and products direct the reader to useful additional information. All programs are written in the BASIC language.

CONSTRUCTIONAL

Tab1449: COMPUTER PERIPHERALS YOU CAN BUILD **$20.95**
Shows you how to build A/D and D/A converters, cassette interfaces, light pens, disk drives, AC and DC control mechanisms, music boards and much more.

HOW TO BUILD YOUR OWN WORKING MICROCOMPUTER
TAB No.1200 **$15.95**
An excellent reference or how-to manual on building your own microcomputer. All aspects of hardware and software are developed as well as many practical circuits.

BP78: PRACTICAL COMPUTER EXPERIMENTS **$6.80**
E.A. PARR, B.Sc., C.Eng., M.I.E.E.
Curiously most published material on the microprocessor tends to be of two sorts, the first treats the microprocessor as a black box and deals at length with programming and using the "beast". The second type of book deals with the social impact. None of these books deal with the background to the chip, and this is a shame as the basic ideas are both interesting and simple.
This book aims to fill in the background to the microprocessor by constructing typical computer circuits in discrete logic and it is hoped that this will form a useful introduction to devices such as adders, memories, etc. as well as a general source book of logic circuits.

KIDS

PH215: KIDS AND THE APPLE
E. CARLSON & DATAMOST **$26.00**
Written primarily for 10 to 14 year-olds, this book helps kids (as well as parents and teachers) become pros at writing Applesoft Basic Programs for home computers. Through a series of 33 sequential, easy-to-follow lessons, examples and exercises, learn how to program Apple computers, to play board games, word games, action games, store and recall personal data, debug, edit, create graphics, even create a program.

PH216: KIDS AND THE VIC
E. CARLSON & DATAMOST **$26.00**
Written primarily for 10 for 14 year-olds plus parents and teachers, this new guide offers sequential, easy-to-follow lessons, examples, and exercises that illustrate how to program the VIC personal computer to play board games, word games, and action games, store and recall personal data, debug, edit, create graphics, and more!

SYSTEM SPECIFIC

COMMODORE

Secrets of the Commodore 64
BP135 **$9.50**
Contains a load of information that assumes no knowledge other than the manual which comes with the computer and is designed to complement that manual. Covers sprites, PEEK and POKE, high resolution graphics, sound facilities, memory maps, machine code programming and much more.

APPLE

HB107: GRAPHICS COOKBOOK FOR THE APPLE
WADSWORTH **$15.95**
Learn how to use your Apple II to "paint" shapes, objects, and letters in low-resolution graphics. The author provides a library of microcomputer graphics including such multicoloured illustrations as robots and flying saucers, trees, sailboats, and colourful picture backgrounds. Contains complete annotated Applesoft BASIC programs to draw all the pictures described in the book as well as suggestions for improving programming techniques.

SB21889: INTERMEDIATE LEVEL APPLE® II HANDBOOK
D. HEISERMAN **$23.95**
Hands-on aid for exploring the entire internal firmware of your Apple II and finding out what you can accomplish with its 6502 microprocessor through machine- and assembly-language programming. Good introduction if you're ready to move out of BASIC but don't want to buy more hardware.

PHS1: PASCAL FOR THE APPLE
IAIN MacCALLUM **$33.80**
A step-by-step introduction to Pascal for Apple II and Apple II Plus users. The package of text and software diskette provides readers with worthwhile and interesting programs which can be run immediately and the results studied. Includes over 200 exercises with full solutions. Book/Disk Package.

PHS2: APPLE GRAPHICS GAMES
PAUL COLLETTA **$40.95**
Contains 10 arcade-style games written especially for the Apple II, including Spider, Piano, Pairs and Poker, as well as education, math, and designing games. Book/Disk Package.

SB21864: MOSTLY BASIC: APPLICATIONS FOR YOUR APPLE® II, BOOK 2 **$18.50**
A second goldmine of fascinating BASIC programs, including two dungeons that test your math and history abilities and another one that's strictly for fun, eleven household programs, a monthly savings plan and six more on money or investment, two that test your level of ESP, and more — 32 in all! Excellent for beginning or advanced computerists.

SB21894: APPLE® II ASSEMBLY LANGUAGE **$22.50**
Specifically directed to the beginning programmer who has no prior experience with assembly language. Shows you how to use the 3-character, 56-word assembly language vocabulary of Apple's 6502 microprocessor to create powerful programs that bring you inside the brain of the Apple itself! Can be read by Apple owners in all walks of life simply as a learning experience or used in a conscientiously applied assembly language study program.

SB22026: POLISHING YOUR APPLE® **$6.95**
Clearly written, highly practical, concise assembly of all procedures needed for writing, disk-filing, and printing programs with an Apple II. Positively ends your searchs through endless manuals to find the routine you need! Should be in the hands of every new Apple user, regradless of experience level. Ideal for Apple classrooms too!

PH106: PROGRAMMING TIPS AND TECHNIQUES FOR THE APPLE II
J. CAMPBELL (1983) **$22.95**
An advanced exploration of the intricacies of structures programming. Further develops the skills necessary to solve programming problems. Special chapter on sound and graphics which discusses both high and low resolution graphics for the Apple II.

Introducing, the Apple Macintosh
SB22361 **$18.50**
Included are How a desktop computer can be more efficient, How MacThinking improves productivity, What is behind the magic of MacWindows, How to get the most from the Mouse, Using MacPaint, MacWrite plus the other MacTools, what software is available, how the 68000 processor works etc.

PH104: ACCOUNTANT'S BASIC PROGRAMMING FOR THE APPLE II
A. PARKER & J. STEWART (1983) **$19.95**
Shows the reader how to program the Apple II to perform a variety of accounting functions, such as payroll, accounts payable, accounts receivable, tax, inventory, customer statements, and more.

PH107: APPLE LOGO PRIMER
G. BITTER & N. WATSON (1983) **$19.95**
A pictorial starter book that will make LOGO easy for anyone. Includes easy to follow examples and reference tables. Also included is a workshop outline for teachers and leaders who want to train others.

PH112: APPLE FILES
D. MILLER (1982) **$19.95**
Aimed at the Apple user who is familiar with BASIC and wants to set up or expand files for home or business. Includes programs for mailing lists, a medical records system, home inventory and more.

PH113: THE VISICALC BOOK: APPLE EDITION
D. BELL (1982) **$19.95**
A helpful and informative guide to using VISICALC, the "electronic spreadsheet" software program that's perfect for pricing/costing estimates; profit/loss forecasting and hundreds of other business "what if" questions. Specifically written for Apple computer systems.

PH118: INTERFACE PROJECTS FOR THE APPLE II
R. HALLIGREN **$16.95**
Provides Apple II users with a series of interface projects that are easily built and enable the user to discover the computer's capabilities through project construction.

IBM P.C.

PH157: INTRODUCTION TO CICS PROGRAMMING
L. MILLER & L. VIANDS **$33.00**
Presents a step-by-step, easy-to-follow introduction to the practical use of CICS — an IBM software product for data communications and the development of on-line computer applications. All examples shown are independent of the operating system, but they assume a basic knowledge of COBOL.

TRS-80

SB21893: TRS-80® COLOUR COMPUTER INTERFACING **$20.95**
Teaches you the interfacing techniques, inner workings, and operation of the TRS-80 Colour Computer as well as its high-performance 6809 microprocessor. Find out how to control and monitor various equipment and events by means of the Computer's expansion connectors. Excellent info for budding electronic and computer engineers and technicians at all levels.

PH121: HARDWARE INTERFACING WITH THE TRS-80
J. UFFENBECK (1983) **$18.95**
TRS-80 Model I and Model III owners now have a book to help them understand how to use their personal computers to monitor and control electronics interfaces between the computer and the home or industrial environment. Contains 14 hands-on experiments using BASIC.

TIMEX/SINCLAIR

BP114: THE ART OF PROGRAMMING THE 16K ZX81 **$9.90**
M. JAMES & S.M. GEE
The book starts by introducing the 16K RAM pack and the printer. It continues by explaining how the extra storage is used and presents a memory test program to check that the 16K RAM pack is operational. Chapter Three covers some utilities that you will find useful in writing longer programs. Chapter Four is an interlude from serious applications, presenting four games programs that make the most of the extended graphics capabilities now available to you. Chapters Five to Eight deal with writing and debugging large programs, storing them on cassettes and printing out both programs themselves and their results. These chapters also introduce programs for editing data bases and statistical analysis for financial management and covers text and graphics printing. Chapter Nine takes a look at randomness. Chapter Ten introduces machine code and explains why you might like to use it.

PET/CBM/VIC

PH57: START WITH BASIC FOR THE COMMODORE VIC 20
D. MONRO **$32.95**
This book/cassette package shows the reader how easy it really is to create programs using the full capacility of the machine. Includes helpful exercises and step-by-step instructions to put the full power of the VIC 20 at the user's fingertips. Book/Cassette Package.

SB22056: COMMODORE 64 PROGRAMMER'S REFERENCE GUIDE **$27.95**
A creative programmer's working tool and reference source, packed with professional tips and special information for getting the most out of your Commodore 64! Includes a complete, details dictionary of all Commodore BASIC commands, statements, and functions, followed by BASIC program samples showing how each item works. Also tells you how to mix machine language with BASIC, use hi-res effectively, and much more! By Commodore Computer, 406 pages.

See order form on page 80

The New Digital Orchestra

Perhaps the best insight into what MIDI based sound systems are capable of can be had from performers and composers who use the new instruments in the real world. The New Digital Orchestra, perhaps the first all MIDI ensemble, talks about its music.

by Gregory Stephen

I don't just write articles about MIDI based sound equipment. Among other things, I play it. I am part of a project called the New Digital Orchestra. Though sounding orchestral, the New Digital Orchestra has only four members. An extensive array of MIDI equipment, including several IBM PCs and a MIDI violin, makes special demands on the studio environment.

The New Digital Orchestra is probably one of the best examples of MIDI hardware in use. Whereas a number of performers have added it to their instruments, as far as I know we're the first group to use it exclusively, starting, as it were, from scratch.

In describing what MIDI can do to players who are rooted in traditional electronic instruments, one is always confronted with the mental limitations imposed by years of rubbing elbows with combo organs, string machines and other very primitive hardware, at least by MIDI standards. As such, I've solicited the comments of the rest of the Orchestra about this new direction for computer sound as a hands-on look at the potential of MIDI.

Eight Bits, No Waiting

Gene Martynec, a Toronto record producer with credentials from top Canadian artists, acknowledges that MIDI has become a component of his studio. On current applications of MIDI, Martynec feels we have seen only a small part of its potential.

"MIDI instruments appear routinely as part of the musicians' equipment, but their application has been restricted mainly to connecting several keyboards together and playing the same notes with different sounds."

Speculating about the expansion of MIDI in the studio, Martynec outlined a hypothetical MIDI mixer. "Essentially, the engineer could create a model in software of the musicians' performance on their MIDI instruments, and a MIDI terminal would display the data. Menus would show the parameters of each piece of MIDI equipment. MIDI codes could then be inserted in the performance data. These states might include volume levels, panning, preset changes, auxiliary feeds, reverb, and outboard effects.

"An output page could configure the instruments so everything moved in and out of the mix in the proper sequence. A composition page would allow moving bulk data around. Sections of music could be copied and repeated. The musicians could preview the mix and edit any event. The perfected MIDI code would then be routed direct to tape, ideally in quadraphonic sound."

Bruce Mitchell is a familiar figure in recording studios. Of the Orchestra and, particularly of the use of the computer in music, Bruce commented "It is the computer, oddly enough, which removes the drudgery of the composer's task. With this new freedom in sound and texture, the listener to music in the future is in for a real treat.

"Simply put, a computer is the extension of the mind of a composer. It will remember all his or her ideas, organize them and execute them exactly the way they were specified.

"For example, take one of the most immediate and demanding forms of composition or performance. . . improvisation.

The New Digital Orchestra

Because the music is created in 'real time', it has aspects of time. . . energy is completely focused in the moment, or the now, of time.

"A computer can capture this experience, which is the true basis of all composition. The music created is closer to the original conception at the moment of inspiration. Once this has occurred, the music may be printed out for publication, or it may be processed and arranged as a multi-timbral work. Once a musical line is recorded from a touch-sensitive MIDI instrument, it may be further processed in ways limited only by one's imagination.

"We have all heard the monotonous drone of filter sweeps, laser guns, and 4/4 drum machine patterns with enough reverb on the synthetic snare to sink a battleship. Of course, I may be as guilty of this as anyone else who has access to sequencers and drum machines . . . it's just too tempting to program simplicity and repetition.

"I believe the computer is putting music back in the hands of talented composers, and I have met several of the calibre of a Beethoven or a Chopin, even in this day and age. One need not become an antiquarian to enjoy music. Computer music is an idiom of the present and future, yet it is the aspect of humanity itself which gives art its validity. Computer music should be composed and performed by people for people. . . programming computers to write and perform music is of interest as an academic exercise at best. Even the label 'computer music' is ill-used, as it is almost irrelevant to a particular art form or style. The computer is only a physical extension of the human being, just as a piano is an interactive device for producing timbres and rhythms."

G String

For Susan Hunter, violinist for the New Digital Orchestra, MIDI posed special complications. Unlike a synthesizer, where the musical data already exists in some electronic form, the violin's tone begins as an acoustic phenomenon, and requires some tricky conversions to arrive at a digital format.

Concerning the MIDI violin, Susan commented "For years, musical instrument manufacturers have catered exclusively to pop musicians. Most serious classical musicians have had to settle for traditional instrument designs in use for centuries. Thus we still have violin, piano, woodwind and brass instruments, all of which have scarcely been altered since their perfection during the past few centuries.

"Certainly, the violin as we know it has changed little since the sixteenth century. This theory of sound production, through exciting an acoustic box by the vibrations of a string, is still being perpetuated today. The radical difference is the way the MIDI violin produces its tone. . . its ability to take the same string vibration and, through a MIDI interface, translate pitch and duration information into digital data that allows the player to 'speak' in the language of a MIDI synthesizer."

With the added capability of accessing digitally sampled sounds like fine master violins, or a multitude of instrumental, percussive and vocal sounds, string players

have literally all the instruments of the orchestra at their fingertips.

In essence, the MIDI violin system comprises three components. The first is a solid body violin and a pickup. The second is a MIDI interface which translates pitch data to MIDI code and the third is a MIDI compatible synthesizer. Of course, once the connection to MIDI has been made, the possibilities exist for multiple synthesizer setups.

MIDI was first successfully accessed from the violin by utilizing three component interfaces, none of which were actually intended to be coupled for this purpose. These interfaces were designed before and during the early stages of MIDI standardization. The end result was extremely promising, although sensitive, somewhat slow in execution, and costly.

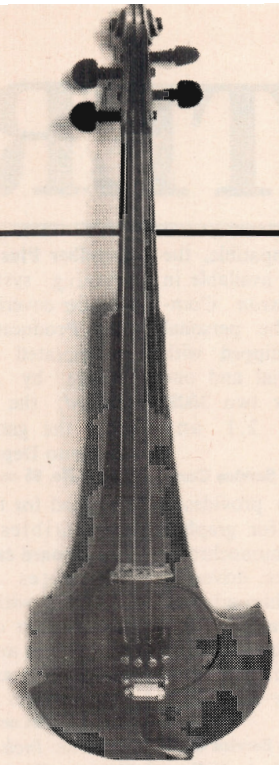
The actual solid body concept of the violin came about as a result of the problems of acoustic feedback when using a traditional violin coupled to a synthesizer. A solid design reduces ambient sound to minimal levels, and the use of modern graphite fibre materials allows for both strength and a lightweight design.

The original designs were a result of a collaboration with instrument designer Zoltan Ari of Vancouver, who furthered the concept by re-designing the violin and pickup system. The final stage involved the design of a fast pitch to MIDI interface, permitting the translation of pitch data to MIDI code at an almost instantaneous rate.

The benefits of a digital violin system are many. Players might now afford the tonal capabilities of a fine old violin. . . a Stradivarius or Guarneri del Jesu. . . without the pains of mortgaging their future to purchase one. Due to a short supply and artistic value, the price of a first class concert violin is simply staggering. . . upwards of a quarter of a million dollars.

Other benefits include the capabilities afforded by computer interface and the possibilities of customizing one's sound. It is also an excellent practice instrument, as it can be played through a home stereo system with audio output through headphones, permitting sometimes repetitious and otherwise annoying practice to occur at all hours of the night without neighbours knocking at the door.

Unlike other members of the Orchestra, the studio of Dominik Szava is conspicuous by the absence of any music keyboard. As a composer, Dominik is able to use the computer to control, in digital form, the actual theory of music. Once the blueprint for a composition is defined, it is converted to MIDI data and sent directly through the MIDI interface to various sound producing



The MIDI violin

oscillators. For music, this arrangement is similar to a word processing station.

Once word processing text is assembled, it goes to a printer. In a MIDI system, instead of the printer, we have musical instruments generating the actual 'hard copy' sound.

"For many years, my music has been worked out on paper, using various notational styles. With the advent of the computer, this process was facilitated by the editing capabilities of the Apple computer and Roland's Compu-Music software, basically a sequencer which requires manual assignment of its control voltage, step and gate times. The completed composition was then recorded in the studio on a multi-track tape recorder by interfacing the Compu-Music with keyboards.

"With MIDI, it is now possible to eliminate the tape recorder, and work digitally with sixteen tracks on an IBM MIDI system. For my purposes, this a major advance in direct editing capabilities.

"We are now developing *absolute music* software, which will allow the composer greater freedom by assigning the theoretical concepts to the computer, leaving the composer with creative decisions, rather than paperwork.

"This starts with determining the order of a melodic cycle of twelve tones, a process involving largely intuition. Mathematically, there are 479,001,600 possible melodic sequences available from a twelve tone series. The development of a piece of music from this sequence differs from traditional motif type composition in that the sequence contains within it, in seed form, the structures of harmony and rhythm. These are only different aspects of the same musical phenomenon, and as such, are extracted from the melodic sequence.

"We have already imposed order on the tonal universe by contriving a deliberately abstract tuning called equal temperament. It is within the boundaries of equal temperament that one applies the laws of 'absolute music' to reveal the musical elements implicit in any constellation of twelve tones. These include chord structures, voice layering, rhythmic possibilities, melodic designs, and so on. Once these have been determined, the creative possibilities for composition are virtually endless, limited only by the composer's intuition and creative insights.

"The sound of musical mathematics is surprisingly pleasant and harmonious. Implicit contrapuntal techniques become child's play in absolute theory, and bring to a composition a wonderful quality of braided melodies.

"Artistic ego has, and still does serve as a source of inspiration for all the arts, including music. Key structures, chord progressions, rhythmic ambiance and dominant tonality conspire with the ego to move the emotions of the artist and audience. In contrast, absolute music, by its mathematical nature, liberates the composer from imposing his will on music. Creativity becomes an intuitive understanding of the unfolding of musical thought. In this way, the absolute composer breathes life into the static nature of mathematics, space and time."

MIDItation

Music is as ancient as speech. Listening to a computer based music system, one cannot help but feel that the computer itself somehow delights in the experience. Perhaps it is fitting that we conclude with a comment from the ethereal mystic master, Koot Hoomi.

"Today, as we enter this new age, we seek primarily through the medium of inspired music, to diffuse the spirit of unification and brotherhood, and thus quicken the vibration of this planet." **CN!**

Passport Designs hardware is available from Remenyi House of Music Limited, 210 Bloor Street West, Toronto, Ontario M5S 1T8

The New Digital Orchestra can be contacted at 129 Glenholme Avenue, Toronto, Ontario M6E 3C2

Absolute Music Studios is at Suite 102, 2001 Bloor Street West, Toronto, Ontario M6S 1M6

COMPUTER PRESS

TEO Computers and Peripherals Inc. have introduced the **TEO BP-5420**, a printer featuring a 24 impact dot matrix, bidirectional printing, and *420* characters per second printing speed in draft mode. Letter quality mode speed is a mere 104 characters per second...
Circle No. 70 on Reader Service Card.

Offering twice the memory capacity of previously available units, *Targa Electronics Systems Inc.* have developed a one-half megabyte **bubble memory cartridge**. The cartridge joins the 128K, 256K and 384K bubble memory versions presently available from Targa...
Circle No. 71 on Reader Service Card.

Goliath Software is the sole Canadian distributor of Morgan Computing, Co.'s **Trace86**, the interactive debugging utility for the IBM PC. The program displays disassembled object code, program opcodes and addresses while the traced program is running, and displays in inverse the line being executed...
Circle No. 69 on Reader Service Card.

A new IBM PC compatible, the **Ericsson PC**, is now available in Canada from *Ericsson Communications Inc.* The personal computer comes equipped with 256K RAM, one serial and one parallel port, one or two 360K drives, MS-DOS 2.1 and GWBASIC...
Circle No. 68 on Reader Service Card.

The **ABM Col-Mon** provides a low-cost alternative for graphics on an IBM PC with a monochrome monitor. The interface, driven by the IBM colour graphics adapter, allows all colour graphics commands to be used on the IBM monochrome monitor. The interface is distributed by *EMJ Data Systems Limited*...
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The **Paper Conveyor** from *Valinco Automation Limited* is an inexpensive sheet feeder for printers equipped with a tractor feed mechanism. The conveyor provides automatic paper positioning and can run various types and sizes of paper one after another...
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Excaliber Plus is an extensive accounting system featuring 12 modules covering as many applications. Produced by Armor Systems Incorporated and distributed in Canada by *Megabyte Systems Limited*, the system's modules cover the gambit from General Ledger to Depreciation...
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Designed for the IBM PC and its compatibles, the *Datatron* **2megaboard** can provide up to two megabytes of RAM when populated with 256-bit chips. Up to a quarter of this RAM is addressable at any given time. When 64-bit chips are implemented, the card provides 512K of memory...
Circle No. 64 on Reader Service Card.

Batteries Included has announced **Keys to Typing**, an instructional program for the Commodore 64. Consisting of 32 step-by-step lessons, the tutorial claims to teach anyone to type with grade 10 proficiency after or before the conclusion of the lessons, an average of about six weeks...
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Operating with a 9 by 9 matrix output at 160 characters per second in draft mode, the **Facit 4511 Serial Matrix Printer** is being distributed by *Lanpar Technologies, Inc.* The printer is available with serial and parallel interfaces, and performs near letter quality printing with a 18 by 17 dot matrix at 40 cps...
Circle No. 62 on Reader Service Card.

GKS/C, a computer graphics standard, is being distributed throughout North America by its manufacturer, *Prior Data Sciences Limited*. Written in C and operating under UNIX (and similar systems), the system runs faster and takes up less memory than other graphics packages, and provides considerable graphics control... **Circle No. 61 on Reader Service Card.**

To complement thier Deskpro series of microcomputers, *Compaq* has introduced a 30 megabyte fixed **hard drive** and an **8087-2 co-processor**. Compaq computers are distributed in Canada by *Micro-Lewis/Compaq Corporation*...
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Continued on p 81

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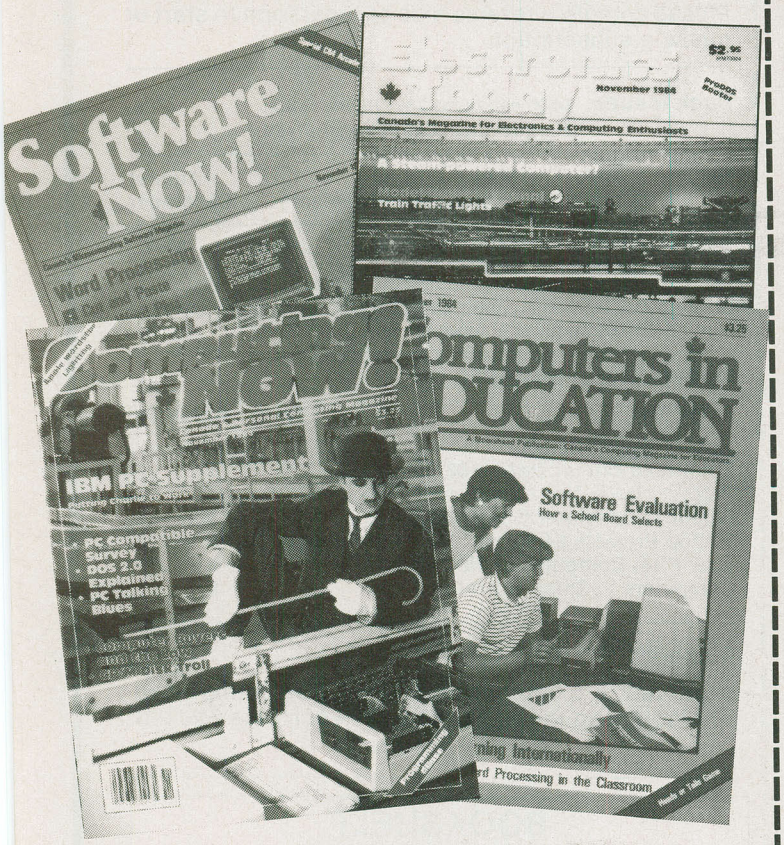

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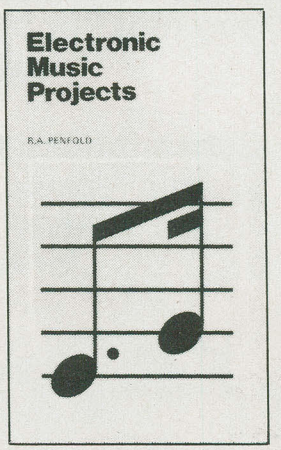

Although one of the more recent branches of amateur electronics, electronic music has now become extremely popular and there are many projects which fall into this category. The purpose of this book is to provide the constructor with a number of practical circuits for the less complex items of electronic music equipment, including such things as a Fuzz Box, Waa-Waa Pedal, Sustain Unit, Reverberation and Phaser-Units, Tremelo Generator etc.

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COMPUTER PRESS

Ideal for advanced engineering, CAD, business, biomedical and other multi-colour graphics applications, the **Gould Colorwriter 6300** series of pen plotters is available in Canada from *Allan Crawford Associates Limited*. Built-in firmware includes three character sets with variable line fonts and zoom and window capabilities... **Circle No. 59 on Reader Service Card.**

Designed to interface with virtually any non-intelligent video display unit, the **Companion** computer turns VDUs into IBM compatible PCs and workstations. Operators can switch instantly between the Companion and the host computer. The Companion is being distributed in Canada by *Volker-Craig Limited*...

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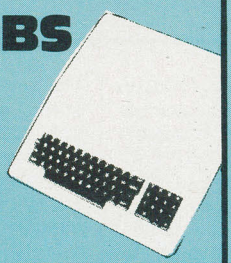

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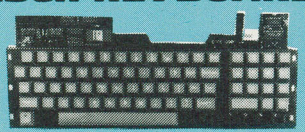

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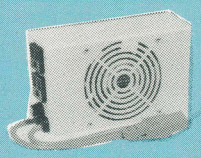

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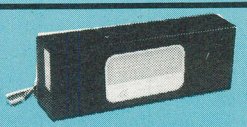

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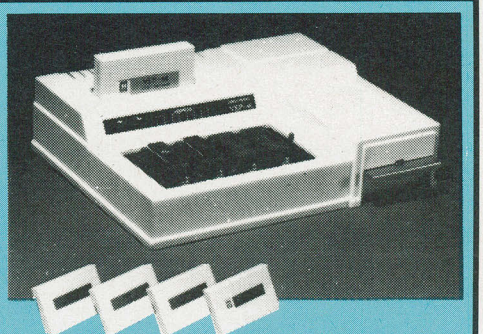

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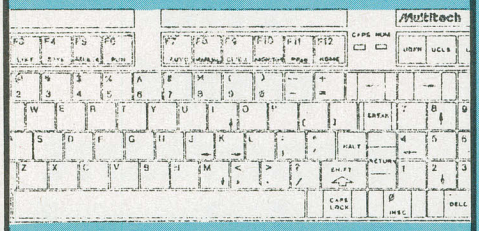

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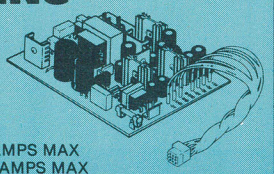

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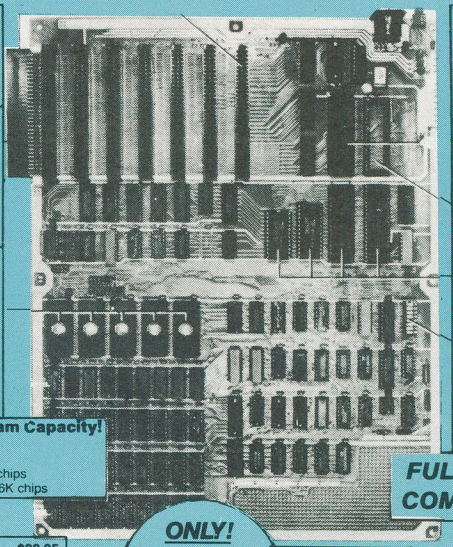

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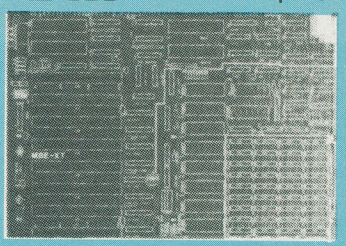

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Dec to Hex Conversion
by Brian Dobbs

A handy programmer's utility that seems to be written for Commodore computers. Minor changes in lines 20, 30, 70, 80 and 110 should make it transportable to any BASIC machine.

```
10 REM BY BRIAN DOBBS-TIMMINS, ONTARIO
20 OPEN4,4:X=1:Y=1:K$="---"
30 PRINT#4,SPC(25)"DECIMAL TO HEX CONVERSION TABLE"CHR$(10)
40 GOSUB130
50 A=INT(X):D=A:IFD-1>9THENK$="--"
60 IFD-1>99THENK$="-"
70 PRINT#4,TAB(5)D-1K$H$;
80 IFX>254THENPRINT#4,TAB(11)"255 -00FF":CLOSE4:END
90 X=X+1:Y=Y+1:IFY=6THEN110
100 GOTO40
110 Y=1:PRINT#4,CHR$(13);
120 GOTO40
130 H$="":D=D/4096:FORI=1TO4:D%=D:H$=H$+CHR$(48+D%-(D%>9)*7):D=16*(D-D%):NEXT
140 RETURN

READY.
```

Orbit
by Edward Mou

An Applesoft program that simulates a satellite orbiting the earth. Crew members of the next space shuttle should take note . . .

```
1  REM  **ORBIT**
50  CLEAR
100  HOME : VTAB (21): HGR : HCOLOR= 7
110  PRINT " PRESS ANY KEY TO CONTINUE "
120  GET A$
125  IF I > 1 THEN 180
130  REM  PLOT THE EARTH
140  FOR Y = 50 TO 110
150 X = 1.2 *  SQR (900 - (Y - 80) * (Y - 80)) + 150
160  HPLOT 300 - X,Y TO X,Y
170  NEXT Y
180  GOTO 1000
200  INPUT "VERTICAL SPEED (0-50) ";VY
210  INPUT "HORIZONTAL SPEED (0-50) ";VX
220  PRINT "ENTER THE STARTING POSITION (X,Y) ";
230  INPUT X,Y
235  HCOLOR= 7
240 Y = 159 - Y
250  HPLOT X,Y
300 XD = X - 150:YD = Y - 80
310 Z = XD * XD + YD * YD
320  IF Z < 900 THEN 500
330 R =  SQR (Z * Z * Z)
340 VX = VX - 5000 * XD / R:VY = VY - 5000 * YD / R
350 X = X + VX / 10:Y = Y + VY / 10
360  IF X > 280 OR X < 0 OR Y > 159 OR Y < 0 THEN 500
370  HPLOT  TO X,Y
380  GOTO 300
500  PRINT
505 I = I + 1
510  GOTO 110
1000  HCOLOR= 7:X =  PDL (0) / .913:Y =  PDL (1) / 1.6
1010  FOR Q = 1 TO 15: HPLOT X,Y: NEXT
1020  HCOLOR= 0: HPLOT X,Y
1025  PRINT " X="; INT (X)," Y="; INT (Y)
1030  IF  PEEK ( - 16287) > 127 THEN 200
1040  GOTO 1000
```

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